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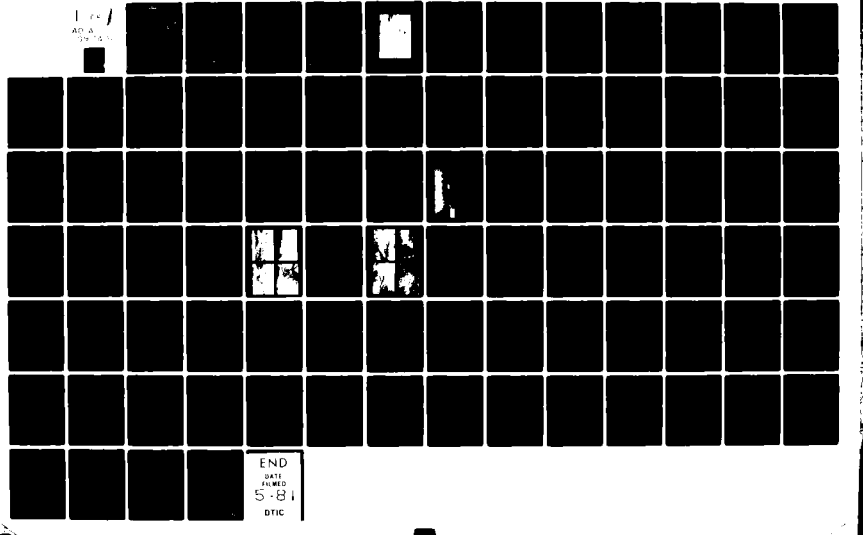

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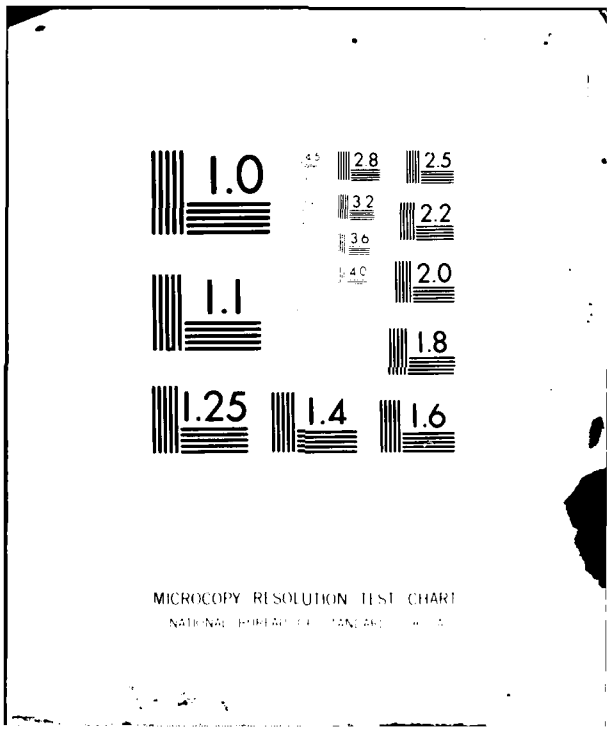
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DELAWARE RIVER BASIN,
BRANCH OF HORNBECKS CREEK, PIKE COUNTY,
PENNSYLVANIA

SOUTH POND DAM

NDI I.D. NO. PA-00639
PENNDER I.D. NO. 52-181

MARCOM, INC.

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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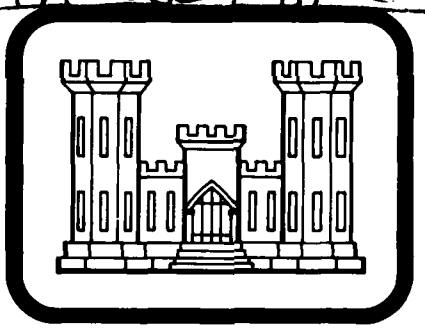

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PREPARED FOR

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

(19) Edward M. Mihalcin

PREPARED BY

GAI CONSULTANTS, INC. (12)
570 BEATTY ROAD
MONROEVILLE, PENNSYLVANIA 15146

(11) JANUARY 1981

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the Spillway Design Flood is based on the estimated Probable Maximum Flood (greatest reasonably possible storm runoff) for the region, or fractions thereof. The Spillway Design Flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

Breach analyses are performed, when necessary, to provide data to assess the potential for downstream damage and possible loss of life. The results are based on specific theoretical scenarios peculiar to the analysis of a particular dam and are not applicable to other related studies such as those conducted under the Federal Flood Insurance Program.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ABSTRACT

South Pond Dam: NDI I.D. No. PA-00639

Owner: Marcon, Inc.

State Located: Pennsylvania (PennDER I.D. No. 52-181)

County Located: Pike

Stream: Branch of Hornbecks Creek

Inspection Date: 16 October 1980

Inspection Team: GAI Consultants, Inc.
570 Beatty Road
Monroeville, Pennsylvania 15146

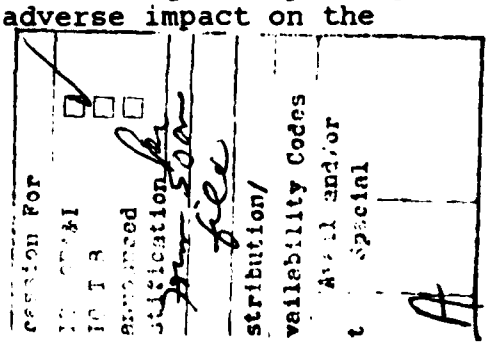
Based on a visual inspection, operational history, and available engineering data, the dam is considered to be in fair condition.

The size classification of the facility is small and the hazard classification is considered to be high. In accordance with the recommended guidelines, the Spillway Design Flood (SDF) ranges between the 1/2 PMF (Probable Maximum Flood) and the PMF. Since the facility is classified near the lower bounds of the small category, the SDF is considered to be the 1/2 PMF. Results of the hydrologic and hydraulic analysis indicate the facility will pass and/or store only about 20 percent of the PMF prior to embankment overtopping. Floods of magnitude greater than 0.2 PMF will cause South Pond Dam to overtop and possibly fail. Breach analysis has shown that failure of the dam would likely not lead to increased property damage or loss of life downstream. Consequently, the spillway is considered to be inadequate, but not seriously inadequate.

It is recommended that the owner immediately:

a. Provide interim erosion protection along the spillway left sidewall adjacent the embankment, as well as, along the downstream embankment toe adjacent to the spillway discharge channel until a more formal spillway assessment is completed.

b. Take remedial measures, under the guidance of a registered professional engineer, necessary to provide adequate spillway capacity at South Pond Dam and assure no adverse impact on the downstream Wild Acres Lake Dam.



South Pond Dam: NDI I.D. No. PA-00639

c. Retain the services of a registered professional engineer experienced in the design and construction of earth embankments to assess the structural integrity of the embankment at the outlet conduit particularly under high pool conditions. Consideration should also be given to extending the outlet conduit and control mechanism downstream and backfilling the incised area with compacted earthfill and/or rock.

d. Provide a means of controlling flow through the outlet conduit at its inlet end or provide an effective plan for blocking the intake in the event that emergency conditions develop within the conduit.

e. Continue to observe, in all future inspections, the wet areas at the outlet conduit noting any general changes in conditions.

f. Develop formal manuals of operation and maintenance to ensure the proper future care and operation of the facility.

g. Develop a formal warning system for the notification of downstream inhabitants should hazardous embankment conditions develop. Included in the plan should be provisions for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

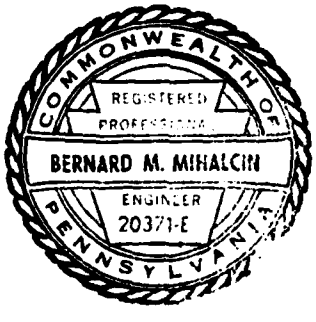
GAI Consultants, Inc.

Bernard M. Mihalcin

Bernard M. Mihalcin, P.E.

Approved by:

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer



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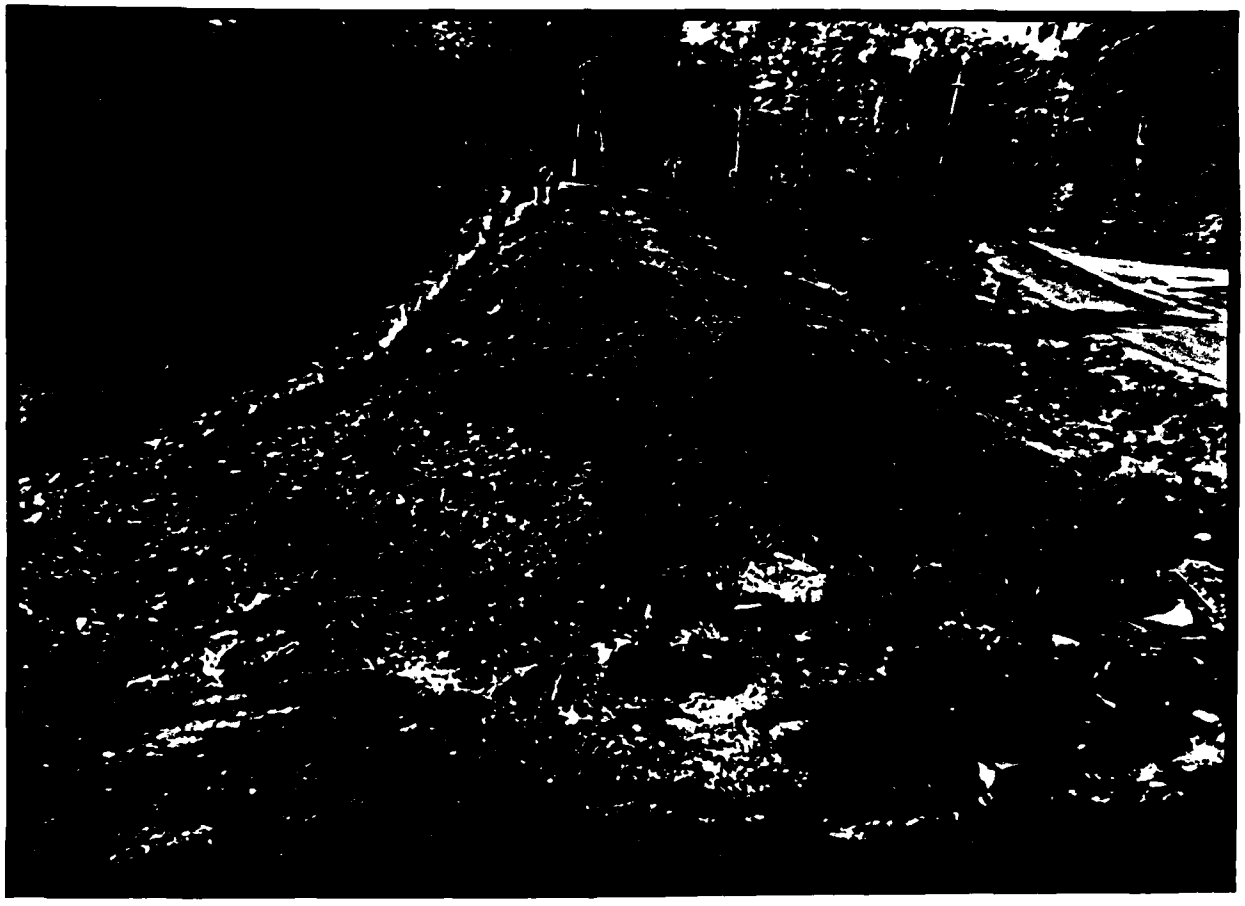

OVERVIEW PHOTOGRAPH

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
SOUTH POND DAM
NDI# PA-00639, PENNDER# 52-181

SECTION 1
GENERAL INFORMATION

1.0 Authority.

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers to initiate a program of inspection of dams throughout the United States.

1.1 Purpose.

The purpose is to determine if the dam constitutes a hazard to human life of property.

1.2 Description of Project.

a. Dam and Appurtenances. South Pond Dam is a 13-foot high earth embankment approximately 268 feet long, including spillway. The spillway is an uncontrolled, trapezoidal shaped channel cut through soil and rock at the right abutment. The channel was constructed without a regulating weir such that discharges are regulated by the channel slope. Drawdown capability is provided by a 12-inch diameter cast iron pipe (CIP) controlled at the discharge end by a manually operated 12-inch diameter gate valve. The embankment cross-section is uniform except for a portion of the downstream embankment face, about 100 feet left of the spillway, which is incised or cut out in a half oval shape apparently to accommodate a short outlet conduit.

b. Location. South Pond Dam is located on a branch of Hornbecks Creek in Delaware Township, Pike County, Pennsylvania. The facility is located about 1,000 feet south of Wild Acres Lake and less than five miles east of U. S. Route 209 which parallels the Delaware River. The dam, reservoir and watershed are contained within the Lake Maskenozha, Pennsylvania-New Jersey, 7.5 minute U.S.G.S. topographic quadrangle (see Figure 1, Appendix E). The coordinates of the dam are N41°13.0' and W75°56.0'.

c. Size Classification. Small (13 feet high, 39 acre-feet storage capacity at top of dam).

d. Hazard Classification. High (see Section 3.1.e).

e. Ownership. Marcon, Inc.
155 Willowbrook Boulevard
P. O. Box 460
Wayne, New Jersey 07470
Attn: Joseph J. Marone
Vice President

f. Purpose. Recreation.

g. Historical Data. No information relative to the history of South Pond Dam was obtained by the inspection team from either the owner or PennDER. It is noted that the U.S.G.S. 7.5 minute topographic quadrangle, Lake Maskenozha, Pennsylvania-New Jersey, indicates the facility was built sometime between the years 1954 and 1973.

1.3 Pertinent Data.

a. Drainage Area (square miles). 0.45

b. Discharge at Dam Site.

Discharge Capacity of Outlet Conduit - Discharge curves are not available.

Discharge Capacity of Spillway at Maximum Pool ≅ 220 cfs (see Appendix D, Sheet 10).

c. Elevations (feet above mean sea level). The following elevations were obtained from field measurements based on the approximate elevation of normal pool at 1142.0 feet as estimated from the U.S.G.S. 7.5 minute topographic quadrangle, Lake Maskenozha, Pennsylvania-New Jersey (see Appendix D, Sheet 1 and Appendix E, Figure 1).

Top of Dam	1144.7 (field).
Maximum Design Pool	Not known.
Maximum Pool of Record	Not known.
Normal Pool	1142.0 (assumed datum).
Spillway Crest	1142.0
Upstream Inlet Invert	Not known.
Downstream Outlet Invert	1131.9 (field).
Streambed at Dam Centerline	1129.0 (estimate).
Maximum Tailwater	Not known.

d. Reservoir Length (feet).

Top of Dam	950
Normal Pool	850

e. Storage (acre-feet).

Top of Dam	39
Normal Pool	19

f. Reservoir Surface (acres).

Top of Dam	9
Normal Pool	6

g. Dam.

Type	Earth.
Length	250 feet (excluding spillway).
Height	13 feet (field measured; embankment crest to downstream outlet invert).
Top Width	13 feet.
Upstream Slope	2H:1V (upper). 3H:1V (lower).
Width of Berm (U/S slope)	Two feet.
Downstream Slope	2.25H:1V 1.25H:1V (at outlet conduit).
Zoning	Not known.
Impervious Core	Not known.
Cutoff	Not known.
Grout Curtain	Not known.

h. Diversion Canal and Regulating Tunnels. None.

i. Spillway.

Type	Uncontrolled, trapezoidal shaped channel cut through soil and rock at the right abutment. No regulating weir. Discharges are regulated by channel slope.
Crest Elevation	1142.0 feet.
Crest Length	Trapezoidal shape. 10-foot base width; 18-foot top width at low top of dam level.

j. Outlet Conduit.

Type	12-inch diameter cast iron pipe.
Length	Not known.
Closure and Regulating Facilities	Flow through the outlet conduit is controlled by a manually operated 12-inch diameter gate valve located at the discharge end.
Access	The control mechanism is accessible by foot at the downstream embankment toe.

SECTION 2
ENGINEERING DATA

2.1 Design.

a. Design Data Availabiity and Sources. No design reports, calculations, miscellaneous design data, correspondence, state inspection reports, design or construction drawings are available from either the owner or PennDER.

b. Design Features.

1. Embankment. Based strictly on visual observations and field measurements, general statements can be made regarding the embankment design. The dam is a 13-foot foot high, 268-foot long embankment, including spillway. It has grass covered slopes and a grass covered crest, 13 feet wide (see Photograph 1 and 4). The upstream embankment face is terraced with a 2-foot wide berm located at about the flow line (normal pool). The slope above the berm is set at 2H:1V and the slope below the berm at 3H:1V. There is no definitive riprap zone along the upstream embankment face; however, the embankment fill is dense and very rocky and appears adequately durable. The downstream embankment face is sloped for the most part at 2.25H:1V. The uniformity of the downstream embankment face is interrupted by an oval shaped incised area located at the outlet conduit near the center of the embankment. The cut was probably made to accommodate a short outlet conduit and is characterized by steep, brush covered slopes (see Photographs 5 and 6). No information is available relative to the internal or foundation design of this structure.

2. Appurtenant Structures.

a. Spillway. The spillway is an uncontrolled, trapezoidal shaped channel partially cut in rock at the right abutment. The spillway does not have a regulating weir or well defined control section. Therefore, discharges are regulated strictly by the channel slope. The discharge channel constricts significantly as it parallels the downstream embankment toe (see Photographs 2 and 5). For the most part, the channel sidewalls are intermittently protected with rock.

b. Outlet Conduit. The outlet conduit is a 12-inch diameter cast iron pipe exposed only at its discharge end. At this point, flow is controlled by a manually operated 12-inch diameter gate valve (see Photographs 6 and 7). No means for controlling flow at the inlet is available.

c. Specific Design Data and Criteria. No design data or information relative to design procedures are available.

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c. Specific Design Data and Criteria. No design data or information relative to design procedures are available.

2.2 Construction Records.

No construction records are available for the facility.

2.3 Operational Records.

No records of the day-to-day operation of the facility are maintained.

2.4 Other Investigations.

There are no available records concerning formal studies or investigations of South Pond Dam.

2.5 Evaluation.

There is no formal information available relative to the design and construction of this facility. The structural design, based solely on external appearances, conforms to modern engineering practices, with the exceptions of the incised area noted along the downstream embankment face at the outlet conduit and the spillway discharge channel located along the downstream embankment toe. Without knowledge of specific design parameters or contruction techniques, any assessment of the integrity of the structure, particularly at high pools or during overtopping, is highly speculative.

SECTION 3
VISUAL INSPECTION

3.1 Observations.

a. General. The general appearance of the facility suggests the dam and its appurtenances are in fair condition.

b. Embankment. Observations made during the visual inspection reveal the embankment is generally well maintained and presently in fair condition. No evidence of seepage through the downstream embankment face, sloughing, animal burrows, or excess embankment settlement was noted. Some minor erosion was observed along the downstream embankment toe near the right abutment where the spillway discharge channel abuts the embankment. The erosion is due, in part, to the design of the channel, which is inadequately sized and, in part, to the lack of adequate slope protection along the channel sidewalls and downstream embankment toe. The condition of the incised area in the vicinity of the outlet conduit was observed to be somewhat saturated and covered with swamp-like vegetation. This condition may be due either to poor channel drainage or leakage along the outlet conduit. This is not considered to be significant at this time, but should continue to be observed. In addition, the steep slopes in this area apparently make routine maintenance difficult. As a result, the area around the outlet conduit has been somewhat neglected.

c. Appurtenant Structures.

1. Spillway. The spillway is considered to be in good condition. Minor erosion of the embankment due to spillway discharges is a condition requiring immediate remedial attention in order to curtail further deterioration. No other deficiencies were observed.

2. Outlet Conduit. The only visible section of the outlet conduit is its discharge end and control mechanism located at the downstream embankment toe. The control mechanism is reportedly functional and in good condition; however, it was not operated in the presence of the inspection team.

d. Reservoir Area. The general area surrounding the reservoir is composed of gentle to moderate slopes that are heavily forested. Several dwellings are located around the perimeter of the reservoir; however, the watershed is primarily undeveloped at present. No signs of slope distress were observed.

e. Downstream Channel. Once through the spillway, discharges from South Pond Dam pass through two 24-inch diameter, corrugated metal pipes laid beneath the paved road immediately below the dam. Beyond this, flow is directed into a small, unlined, trapezoidal shaped channel that discharges into Wild Acres

Lake about 1,000 feet downstream. Between South Pond Dam and Wild Acres Lake a single dwelling is located sufficiently near the stream that it may be affected by an embankment breach. The downstream Wild Acres Lake is a much larger reservoir than South Pond Dam having a surface area of about about 82 acres at normal pool. The impounding structure is located at the northeast end of the reservoir opposite the inlet from South Pond Dam. Wild Acres Lake Dam (Phase I Inspection Report, National Dam Inspection Program, NDI I.D. No. 00268, prepared by GAI Consultants, Inc., dated January 1981) is an earth and rockfill embankment about eight feet high and 420 feet long. The spillway has 1.3 feet of available freeboard and 110 acre-feet of flood storage. Approximately 9,000 feet downstream of the dam, is located a seasonal recreation camp called Camp Log-N-Twig. A rough estimate of the number of inhabitants of the camp during the peak season is difficult, but, can be reasonably assumed to be more than a few (three) and as many as several hundred. Thus, Wild Acres Lake Dam is classified as a high hazard based on its high potential for significant property damage and possible loss of life downstream in the event of an embankment breach. Moreover, the performance of South Pond Dam may affect the performance of Wild Acres Lake Dam. Consequently, the hazard classification of South Pond Dam is considered to be high.

3.2 Evaluation.

The overall appearance of the facility suggests it to be in fair condition. The facility and its appurtenances are generally well maintained; however, the existence of the incised area at the outlet conduit is considered to be a significant design deficiency requiring further evaluation. Minor erosion along the downstream embankment toe does require remedial attention beyond routine maintenance. Additionally, the swampy condition at the outlet should continue to be observed and noted in all future inspections. Outlet conduit control is presently provided at the downstream end and requires either modification or a plan to control flow at the upstream end should emergency conditions develop within the conduit.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Normal Operating Procedure.

South Pond Dam is essentially a self-regulating facility. Excess inflow is automatically discharged through the uncontrolled spillway. Under normal operating conditions the outlet conduit is closed. The outlet conduit control mechanism is not operated on a regular basis and was not operated in the presence of the inspection team, but, it is reportedly functional. No formal operations manual is available.

4.2 Maintenance of Dam.

The facility is, for the most part, well maintained, but, on an unscheduled basis. Excess vegetation and swampy conditions characterize the area around the outlet conduit. No formal maintenance manual is available.

4.3 Maintenance of Operating Facilities.

The outlet conduit control mechanism is reportedly functional; however, it is not operated on a regular basis nor is it included in any schedule of regular routine maintenance.

4.4 Warning System.

No formal warning system is presently in effect.

4.5 Evaluation.

The general appearance of the facility indicates it to be well maintained with the exception of the area around the outlet conduit. No formal program of regular routine maintenance has been established; however, formal manuals of operations and maintenance are recommended to ensure continued proper care of the facility. Incorporated into these manuals should be a formal warning system for the protection of downstream inhabitants. The system should include provisions for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

SECTION 5
HYDROLOGIC/HYDRAULIC EVALUATION

5.1 Design Data.

No formal design reports, calculations, or miscellaneous design data are available for the facility.

5.2 Experience Data.

Daily records of reservoir levels and/or spillway discharges are not available.

5.2 Visual Observations.

On the date of the inspection, no conditions were observed that would indicate the spillway could not function satisfactorily during a flood event, within the limits of its design capacity. It is noted that the spillway channel sidewalls adjacent to the embankment are in need of additional rock slope protection. Under present conditions, large spillway discharges could induce significant embankment erosion adjacent the spillway prior to embankment overtopping.

5.4 Method of Analysis.

The facility has been analyzed in accordance with the procedures and guidelines established by the U. S. Army, Corps of Engineers, Baltimore District, for Phase I hydrologic and hydraulic evaluations. The analysis has been performed utilizing a modified version of the HEC-1 program developed by the U. S. Army, Corps of Engineers, Hydrologic Engineering Center, Davis, California. Analytical capabilities of the program are briefly outlined in the preface contained in Appendix D.

5.5 Summary of Analysis.

a. Spillway Design Flood (SDF). In accordance with the procedures and guidelines contained in the National Guidelines for Safety Inspection of Dams for Phase I Investigations, the Spillway Design Flood (SDF) for South Pond Dam ranges between the 1/2 PMF (Probable Maximum Flood) and the PMF. This classification is based on the relative size of the dam (small) and the potential hazard of dam failure to downstream developments (high). Since the facility is classified near the lower bounds of the small category, the SDF for the facility is considered to be the 1/2 PMF.

b. Results of Analysis. South Pond Dam was evaluated under normal operating conditions. That is, the reservoir was initially at its normal pool or spillway elevation of approximately 1142.0 feet, with the spillway discharging freely. The spillway consists of an uncontrolled, trapezoidal shaped channel cut through soil and rock at the right abutment. The outlet conduit was assumed to be nonfunctional for the purpose of analysis, since the discharge capacity of the conduit is not such that it would significantly increase the total discharge capabilities of the dam and reservoir. All pertinent engineering calculations relative to the evaluation of South Pond Dam are provided in Appendix D.

Overtopping analysis (using the modified HEC-1 computer program) indicated that the discharge/storage capacity of South Pond Dam can accommodate only about 20 percent of the PMF prior to embankment overtopping. Under the 1/2 PMF (SDF) event, the embankment crest was inundated for about 5.2 hours by depths of up to 1.1 feet (Summary Input/Output Sheets, Sheet C). Since the SDF for South Pond Dam is the 1/2 PMF, it can be concluded that the dam has a high potential for overtopping, and thus, for breaching under floods of less than 1/2 PMF magnitude.

As South Pond Dam cannot safely accommodate a flood of at least 1/2 PMF magnitude, the possibility of embankment failure under floods of 1/2 PMF intensity or less was investigated (in accordance with Corps directive ETL-1110-2-234). Several possible alternatives were examined, since it is difficult, if not impossible, to determine exactly how or if a specific dam will fail. The major concern of the breaching analysis is with the impact of the various breach discharges on increasing downstream water surface elevations above those to be expected if breaching did not occur. Included in the analysis were the effects of a possible failure of South Pond Dam on the downstream Wild Acres Lake Dam.

The modified HEC-1 computer program was used for the breaching analysis with the assumption that the breaching of an earth dam would begin once the reservoir level reached the elevation of the low area in the embankment crest. Also, in routing the outflows downstream, the channel bed was assumed to be initialy dry, and the possibility of additional runoff in the downstream watersheds was not considered.

Five breach models were analyzed for South Pond Dam. First, two sets of breach geometry were evaluated for each of two failure times. The two sets of breach sections chosen were considered to be the minimum and maximum probable failure sections. The two failure times (total time for each breach section to reach its final dimensions) under which the two breach sections were investigated were assumed to be a rapid time (0.5 hours) and a prolonged time (3.0 hours), so that a range of this most sensitive variable might be examined. In addition, an average possible set of breach conditions was analyzed with a failure time of 1.0 hour (Appendix D, Sheet 13). These breach models were analyzed under 0.25 PMF and 0.50 PMF conditions. The peak breach outflows resulting from 0.25 PMF conditions at South Pond Dam ranged from about 490 cfs to

about 2,150 cfs, compared to the non-breach 0.25 PMF peak outflow of approximately 280 cfs. Under 0.50 PMF conditions, the peak breach outflows ranged from about 850 cfs to about 2,110 cfs, compared to the non-breach 0.50 PMF peak outflow of approximately 630 cfs (Summary Input/Output Sheets, Sheets H and K).

The outflows from South Pond Dam were routed through Wild Acres Lake, located approximately 1,000 feet downstream (see Figure 1). Under 0.25 PMF conditions, the breach outflows from South Pond Dam, under all breach plans, were safely accommodated by Wild Acres Lake Dam. That is, no embankment overtopping occurred. Under 0.50 PMF conditions, the breach outflows from South Pond Dam resulted in the overtopping of Wild Acres Lake Dam by up to 0.5 feet above the low area in the embankment crest. However, the non-breach 0.50 PMF outflow from South Pond Dam also resulted in the overtopping of Wild Acres Lake Dam by up to 0.3 feet. The duration of the overtopping in all cases ranged from 5.0 to 6.0 hours.

Based on this analyses, it is unlikely that the failure of South Pond Dam would result in the failure of Wild Acres Lake Dam. Also, it must be noted that the spillway at Wild Acres Lake Dam has been found to be seriously inadequate and requires remedial modifications (see Phase I Inspection Report). Should Wild Acres Lake Dam be made hydraulically adequate, then it is likely that there would be even less overtopping of its embankment, or possibly none at all, due to the failure of South Pond Dam. Therefore, from this analysis it is concluded that the failure of South Pond Dam would most likely not lead to increased property damage or loss of life in the downstream regions, as they exist at present.

5.6 Spillway Adequacy.

The analysis indicates that South Pond Dam can accommodate only about 20 percent of the PMF prior to embankment overtopping. Should a flood of magnitude greater than this occur, the dam would be overtopped and could possibly fail. However, since the failure of South Pond Dam would probably not lead to increased property damage or loss of life downstream, its spillway is considered to be inadequate, but not seriously inadequate.

SECTION 6

EVALUATION OF STRUCTURAL INTEGRITY

6.1 Visual Observations.

a. Embankment. The facility is well maintained, but, in view of its apparent design deficiencies, the embankment is considered to be in fair condition. An assessment of the overall design or, moreover, the integrity of the structure, particularly at high pools or during overtopping, is highly speculative due to the lack of relevant design data. Nevertheless, based strictly on visual observations, it can be seen that the embankment is constructed to dimensions that conform to modern design criteria with the obvious exception of the incised area along the downstream embankment face at the outlet conduit. This area represents a local weak spot in the embankment cross-section. In addition, observations made during the visual inspection indicate the area is difficult to maintain. It is recommended that in view of this apparent design anomaly, the structural integrity of the embankment be evaluated, particularly under high pool conditions, by a registered professional engineer experienced in the design and construction of earth embankments. It is suggested that consideration be given to extending the present outlet conduit and control mechanism downstream and backfilling the incised area with compacted earth and/or rock in order to achieve a more stable and uniform downstream embankment slope.

b. Appurtenant Structures.

1. Spillway. The spillway is considered to be in good structural condition. Lack of adequate slope protection along the discharge channel sidewalls, where the embankment actually abuts the channel, has resulted in some minor erosion. Presently, the condition is not considered significant; however, remedial measures should be considered to curtail further deterioration.

2. Outlet Conduit. The outlet conduit is reportedly functional and in good condition. Swampy conditions in the vicinity of its discharge end at the downstream embankment toe are suspected to be the result of either poor drainage or minor leakage through or around the conduit. The conditions should continue to be observed in all future inspections.

The outlet conduit was constructed with a flow control mechanism at its discharge end. However, provisions should be made to either control flow from the inlet or effectively block the intake so that flow can be halted in the event a leak or rupture of the conduit occurs beneath the embankment, which could lead to piping.

6.2 Design and Construction Techniques.

No information is available that details the methods of design and/or construction.

6.3 Past Performance.

No records relative to the performance history of this facility are available. The owner's representative stated, however, that the embankment had never been overtopped to his knowledge.

6.4 Seismic Stability.

The dam is located in Seismic Zone No. 1 and may be subject to minor earthquake induced dynamic forces. It is believed that the facility, as constructed, can withstand the expected dynamic forces, with the possible exception of the steeply sloped area of the downstream embankment face at the outlet conduit; however, no calculations and/or investigations were performed to confirm this opinion.

SECTION 7

ASSESSMENT AND RECOMMENDATIONS FOR REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The results of this investigation indicate the facility is in fair condition.

The size classification of the facility is small and the hazard classification is considered to be high. In accordance with the recommended guidelines, the Spillway Design Flood (SDF) ranges between the 1/2 PMF (Probable Maximum Flood) and the PMF. Since the facility is classified near the lower bounds of the small category, the SDF is considered to be the 1/2 PMF. Results of the hydrologic and hydraulic analysis indicate the facility will pass and/or store only about 20 percent of the PMF prior to embankment overtopping. Floods of greater than 0.2 PMF will cause South Pond Dam to overtop and possibly fail. Breach analysis has shown that failure of the dam would likely not lead to increased property damage or loss of life downstream. Consequently, the spillway is considered to be inadequate, but not seriously inadequate.

b. Adequacy of Information. The available data are considered sufficient to make a reasonable Phase I assessment of the facility.

c. Urgency. The recommendations listed below should be implemented immediately.

d. Necessity for Additional Investigations. Additional investigations are deemed necessary to determine appropriate methods to provide adequate spillway capacity for the facility.

7.2 Recommendations/Remedial Measures.

It is recommended that the owner immediately:

a. Provide interim erosion protection along the spillway left sidewall adjacent the embankment, as well as, along the downstream embankment toe adjacent to the spillway discharge channel until a more formal spillway assessment is completed.

b. Take remedial measures, under the guidance of a registered professional engineer, necessary to provide adequate spillway capacity at South Pond Dam and assure no adverse impact on the downstream Wild Acres Lake Dam.

c. Retain the services of a registered professional engineer experienced in the design and construction of earth embankments to

assess the structural integrity of the embankment at the outlet conduit particularly under high pool conditions. Consideration should also be given to extending the outlet conduit and control mechanism downstream and backfilling the incised area with compacted earthfill and/or rock.

d. Provide a means of controlling flow through the outlet conduit at its inlet end or provide an effective plan for blocking the intake in the event that emergency conditions develop within the conduit.

e. Continue to observe, in all future inspections, the wet areas at the outlet conduit noting any general changes in conditions.

f. Develop formal manuals of operation and maintenance to ensure the proper future care and operation of the facility.

h. Develop a formal warning system for the notification of downstream inhabitants should hazardous embankment conditions develop. Included in the plan should be provisions for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

APPENDIX A

VISUAL INSPECTION CHECKLIST AND FIELD SKETCHES

CHECK LIST
VISUAL INSPECTION
PHASE 1

NAME OF DAM South Pond Dam STATE Pennsylvania COUNTY Pike

NDI # PA — 00639 PENNDER # 52-181

TYPE OF DAM Earth SIZE Small HAZARD CATEGORY High

DATE(S) INSPECTION 16 October 80 WEATHER Partly Cloudy TEMPERATURE 50° @ 11:00 am

POOL ELEVATION AT TIME OF INSPECTION 1140.9 M.S.L.

TAILWATER AT TIME OF INSPECTION N/A M.S.L.

INSPECTION PERSONNEL	OWNER REPRESENTATIVES	*OTHERS*
B. M. Mihalcin	None.	
D. J. Spaeder		
D. L. Bonk		

RECORDED BY B. M. Mihalcin

EMBANKMENT

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA- 00639
SURFACE CRACKS	None observed.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed. Embankment is locally steep along downstream face at outlet conduit. The embankment cross-section at this location has been reduced and appears weaker than remainder of dam. Design is questionable.
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Slight erosion observed along downstream embankment toe near the right abutment where the spillway discharge abuts the dam. Eroded section measures about 25 feet in length.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Horizontal - Good. Vertical - see "Profile of Dam Crest from Field Survey", Appendix A.
RIPRAP FAILURES	No apparent riprap zone; however; embankment earth fill is very rocky and appears to provide adequate slope protection in itself. No evidence of significant erosion was observed.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Junction of embankment and spillway is presently in good condition; however, a lack of adequate slope protection is evident along the left channel sidewall. The condition increases the susceptibility of the embankment to erosion during high spillway discharges.

EMBANKMENT

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA · 00639
DAMP AREAS IRREGULAR VEGETATION (LUSH OR DEAD PLANTS)	Hydrophilic vegetation observed in the general area of the outlet discharge. Condition may be due to poor drainage along outlet discharge channel and/or leakage along pond drain pipe.
ANY NOTICEABLE SEEPAGE	No apparent seepage through the downstream embankment face although area along the downstream embankment toe near the outlet discharge is saturated.
STAFF GAGE AND RECORDER	None.
DRAINS	None apparent.
VEGETATION	Majority of embankment is grass covered. Exception occurs at incised area where outlet is located and shrubs and small trees have become rooted.
MISCELLANEOUS	Embankment appears to be constructed of dense, very rocky soil - probably till.

OUTLET WORKS

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00639
INTAKE STRUCTURE	Submerged, not observed.
OUTLET CONDUIT (CRACKING AND SPALLING OF CONCRETE SURFACES)	Visible only at discharge end where a 12-inch diameter cast iron pipe is exposed.
OUTLET STRUCTURE	Rubble rock headwall at discharge end of outlet conduit.
OUTLET CHANNEL	Rock lined channel - partially silted.
GATE(S) AND OPERATIONAL EQUIPMENT	Chapman 12-inch diameter gate valve with handwheel. Good condition.

EMERGENCY SPILLWAY

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA- 00639
TYPE AND CONDITION	Uncontrolled, trapezoidal shaped channel with no regulating weir located at the right abutment. Channel appears cut in rock along embankment centerline and rocklined elsewhere.
APPROACH CHANNEL	Rock lined - no forebay.
SPILLWAY CHANNEL AND SIDEWALLS	Channel appears partially cut in rock and rock lined. Sidewalls are partially rock lined. Some erosion evident along sidewalls where channel abuts the downstream embankment toe.
STILLING BASIN PLUNGE POOL	None.
DISCHARGE CHANNEL	Small, trapezoidal shaped, partially rock lined channel. Discharges into two 24-inch diameter CMP's that pass under the paved roadway immediately below the dam. Flows discharge into Wild Acres Lake about 1000 feet downstream.
BRIDGE AND PIERS EMERGENCY GATES	None.

SERVICE SPILLWAY

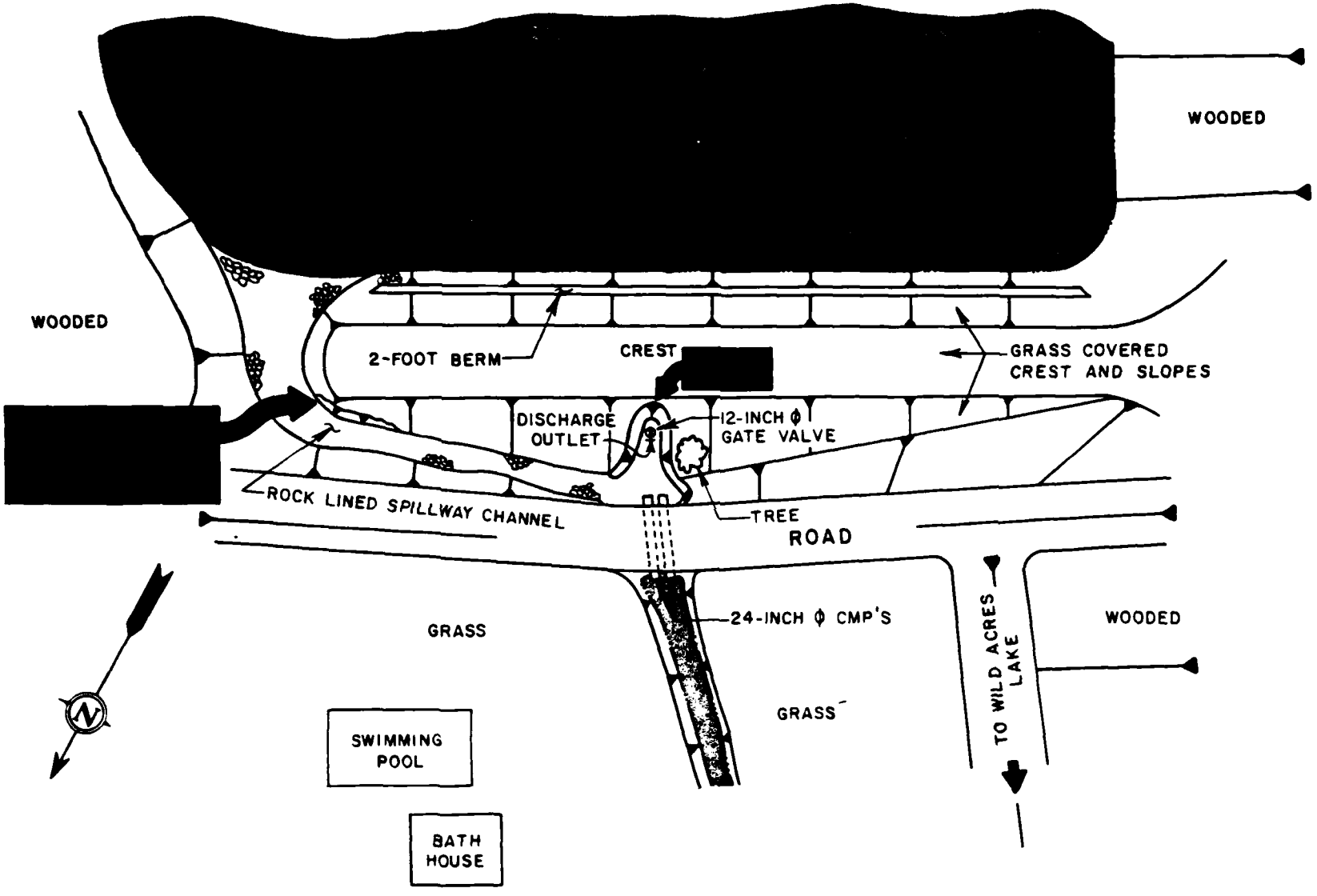
ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00639
TYPE AND CONDITION	N/A
APPROACH CHANNEL	N/A
OUTLET STRUCTURE	N/A
DISCHARGE CHANNEL	N/A

INSTRUMENTATION

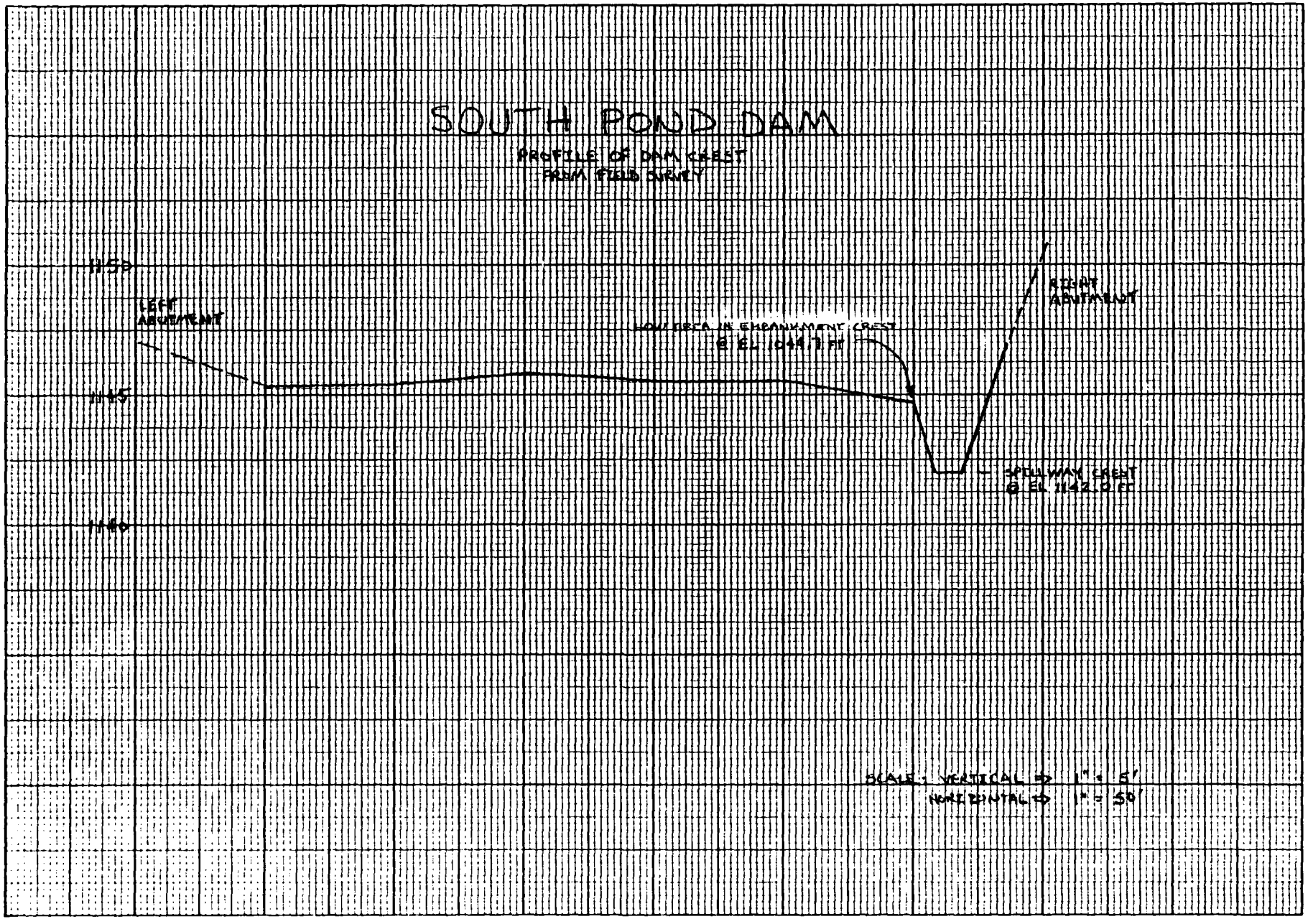
ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00639
MONUMENTATION SURVEYS	None.
OBSERVATION WELLS	None.
WEIRS	None.
PIEZOMETERS	None.
OTHERS	

RESERVOIR AREA AND DOWNSTREAM CHANNEL

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00639
SLOPES: RESERVOIR	The general area surrounding the reservoir is composed of gentle to moderate slopes that are heavily forested.
SEDIMENTATION	None observed.
DOWNSTREAM CHANNEL (OBSTRUCTIONS, DEBRIS, ETC.)	Paved roadway immediately beyond the downstream embankment toe. Discharges pass through two 24-inch diameter BCCMP culverts.
SLOPES: CHANNEL VALLEY	Small unlined, trapezoidal shaped channel discharges into Wild Acres Lake about 1,000 feet downstream.
APPROXIMATE NUMBER OF HOMES AND POPULATION	A single dwelling is located between South Pond Dam and Wild Acres Lake. Camp Log-N-Twig, a seasonal recreation camp, is located about 9,000 feet downstream of Wild Acres Lake Dam. Camp likely has several hundred inhabitants during peak season.



SOUTH POND DAM
GENERAL PLAN - FIELD INSPECTION NOTES



APPENDIX B

ENGINEERING DATA CHECKLIST

CHECK LIST
ENGINEERING DATA
PHASE I

NAME OF DAM South Pond Dam

ITEM	REMARKS	NDI# PA - 00639
PERSONS INTERVIEWED AND TITLE	Monroe Engineering, Inc. (Subsidiary of Marcon, Inc.) Leonard Tusar - General Manager Interview took place at Wild Acres Lake Dam several hours prior to the inspection of this facility.	
REGIONAL VICINITY MAP	See Figure 1, Appendix E.	
CONSTRUCTION HISTORY	Constructed sometime between 1954 and 1973. Dam was never permitted for construction by the state.	
AVAILABLE DRAWINGS	None available.	
TYPICAL DAM SECTIONS	None available.	
OUTLETS: PLAN DETAILS DISCHARGE RATINGS	None available.	

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS	NDI# PA - 00639
SPILLWAY: PLAN SECTION DETAILS	None available.	
OPERATING EQUIP- MENT PLANS AND DETAILS	None available.	
DESIGN REPORTS	None available.	
GEOLOGY REPORTS	None available.	
DESIGN COMPUTATIONS: HYDROLOGY AND HYDRAULICS STABILITY ANALYSES SEEPAGE ANALYSES	None available.	
MATERIAL INVESTIGATIONS: BORING RECORDS LABORATORY TESTING FIELD TESTING	None available.	

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS	NDI# PA - 00639
BORROW SOURCES	Not known.	
POST CONSTRUCTION DAM SURVEYS	None.	
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None.	
HIGH POOL RECORDS	No formal records are available.	
MONITORING SYSTEMS	None.	
MODIFICATIONS	None.	

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS	NDI# PA - 00639
PRIOR ACCIDENTS OR FAILURES	None.	
MAINTENANCE: RECORDS MANUAL	No records or manual are available.	
OPERATION: RECORDS MANUAL	No records or manual are available.	
OPERATIONAL *PROCEDURES*	Self-regulating.	
WARNING SYSTEM AND/OR COMMUNICATION FACILITIES	None.	
MISCELLANEOUS		

GAI CONSULTANTS, INC.

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

NDI ID # PA-00639
PENNDER ID # 52-181

SIZE OF DRAINAGE AREA: 0.45 square miles.

ELEVATION TOP NORMAL POOL: 1142.0 STORAGE CAPACITY: 19 acre-feet.

ELEVATION TOP FLOOD CONTROL POOL: -- STORAGE CAPACITY: --

ELEVATION MAXIMUM DESIGN POOL: -- STORAGE CAPACITY: --

ELEVATION TOP DAM: 1144.7 STORAGE CAPACITY: 39 acre-feet.

SPILLWAY DATA

CREST ELEVATION: 1142.0

TYPE: Trapezoidal channel cut into soil and rock.

CREST LENGTH: 10 feet (base width); 28 feet (top width at low top of dam level

CHANNEL LENGTH: Approximately 130 feet.

SPILLOVER LOCATION: Right abutment.

NUMBER AND TYPE OF GATES: None.

OUTLET WORKS

TYPE: 12-inch diameter cast iron pipe.

LOCATION: Near center of embankment.

ENTRANCE INVERTS: Not known.

EXIT INVERTS: 1131.9 (field).

EMERGENCY DRAWDOWN FACILITIES: Chapman 12-inch diameter gate valve with handwheel.

HYDROMETEOROLOGICAL GAGES

TYPE: None.

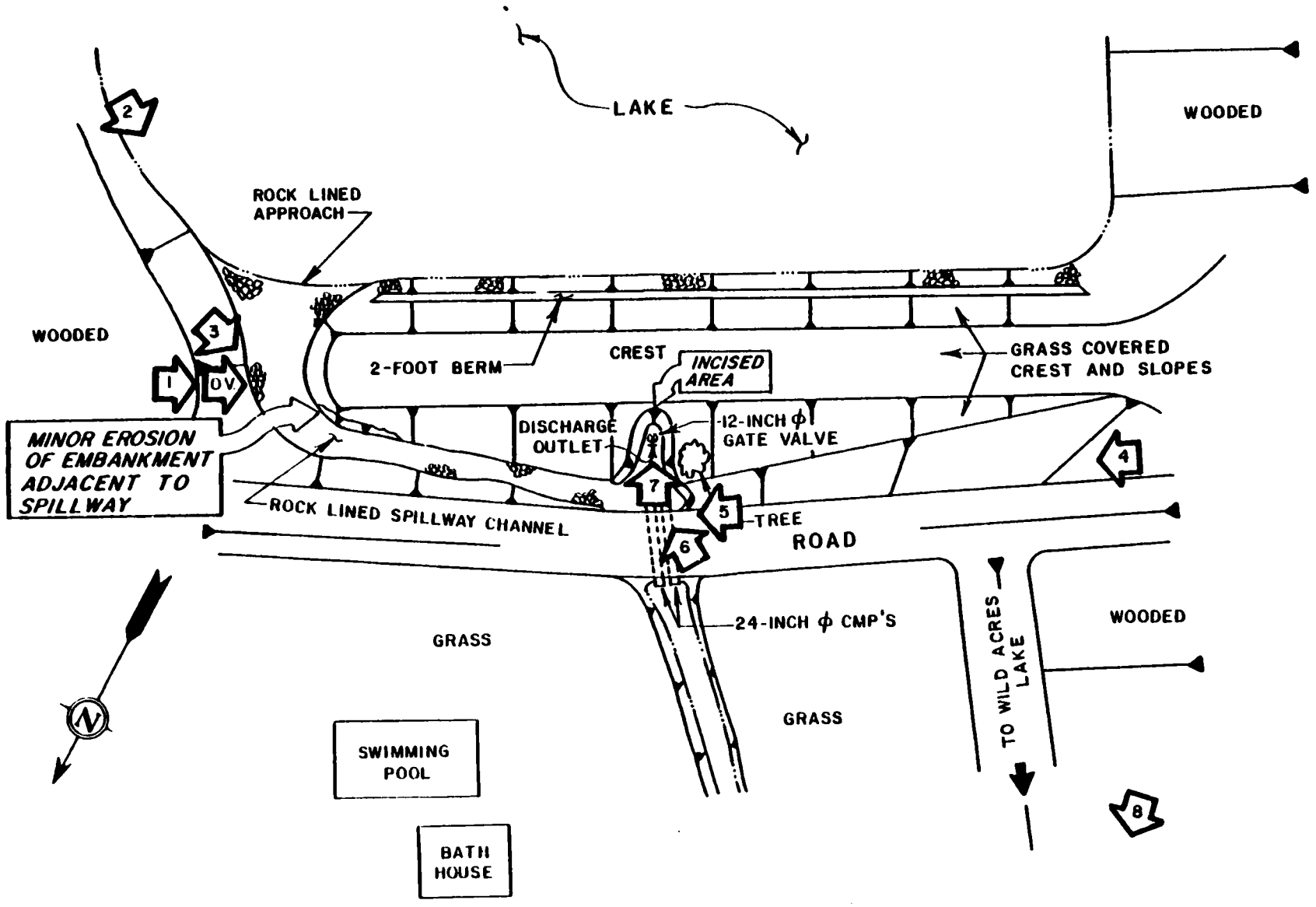
LOCATION: N/A.

RECORDS: N/A.

MAXIMUM NON-DAMAGING DISCHARGE: Not known.

APPENDIX C

PHOTOGRAPHS



SOUTH POND DAM
PHOTOGRAPH KEY MAP

PHOTOGRAPH 1 Overview of the embankment crest as seen from the right abutment. Part of the spillway is visible in the foreground of the view.

PHOTOGRAPH 2 View of the spillway control section and discharge channel.

PHOTOGRAPH 3 View of the spillway approach area and upstream embankment face.

PHOTOGRAPH 4 View of the downstream embankment face as seen from the downstream embankment toe near the left abutment.

1

2

3

4

PHOTOGRAPH 5 View of the downstream embankment face between the right abutment and outlet conduit.

PHOTOGRAPH 6 View of the incised portion of the downstream embankment face where the outlet conduit control mechanism is located.

PHOTOGRAPH 7 Close-up view of the outlet conduit control mechanism located at the downstream embankment toe.

PHOTOGRAPH 8 View of the upper reach of Wild Acres Lake located approximately 1000 feet downstream of South Pond Dam.

5

6

7

8

APPENDIX D

HYDROLOGIC AND HYDRAULIC ANALYSES

PREFACE

The modified HEC-1 program is capable of performing two basic types of hydrologic analyses: 1) the evaluation of the overtopping potential of the dam; and 2) the estimation of the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. Briefly, the computational procedures typically used in the dam overtopping analysis are as follows:

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.

c. Routing of the outflow hydrograph(s) from the reservoir to desired downstream locations. The results provide the peak discharge(s), time(s) of occurrence the peak discharge(s), and the maximum stage(s) of each routed hydrograph at the downstream end of each reach.

The evaluation of the hydrologic-hydraulic consequences resulting from an assumed structural failure (breach) of the dam is typically performed as shown below.

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir.

c. Development of a failure hydrograph(s) based on specified breach criteria and normal reservoir outflow.

d. Routing of the failure hydrograph(s) to desired downstream locations. The results provide estimates of the peak discharge(s), time(s) to peak and maximum water surface elevation(s) of failure hydrograph(s) for each location.

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: SOUTH POND DAM

PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.0 INCHES/24 HOURS (1)

STATION	1	2	3
STATION DESCRIPTION	SOUTH POND DAM		
DRAINAGE AREA (SQUARE MILES)	0.45		
CUMULATIVE DRAINAGE AREA (SQUARE MILES)	-		
ADJUSTMENT OF PMF FOR DRAINAGE AREA LOCATION (%) (1)	ZONE 1		
6 HOURS	111		
12 HOURS	123		
24 HOURS	133		
48 HOURS	142		
72 HOURS	-		
SNYDER HYDROGRAPH PARAMETERS			
ZONE (2)	1		
C_p (3)	0.45		
C_t (3)	1.23		
L (MILES) (4)	1.1		
L_{ca} (MILES) (4)	0.5		
$t_p = C_t (L \cdot L_{ca})^{0.3}$ (HOURS)	1.03		
SPILLWAY DATA (5)			
CREST LENGTH (FEET)	10		
FREEBOARD (FEET)	2.7		

(1) HYDROMETEOROLOGICAL REPORT 33, U.S. ARMY CORPS OF ENGINEERS, 1956.
(2) HYDROLOGIC ZONE DEFINED BY CORPS OF ENGINEERS, BALTIMORE DISTRICT, FOR DETERMINATION OF SNYDER COEFFICIENTS (C_p AND C_t).
(3) SNYDER COEFFICIENTS
(4) L = LENGTH OF LONGEST WATERCOURSE FROM DAM TO BASIN DIVIDE
L_{ca} = LENGTH OF LONGEST WATERCOURSE FROM DAM TO POINT OPPOSITE BASIN CENTROID.
(5) SEE SHEET 5.

SUBJECT DAM SAFETY INSPECTION
SOUTH POND DAM

BY JJS DATE 11-24-80 PROJ. NO. 80-238-639

CHKD. BY JRL DATE 12/10/80 SHEET NO. 1 OF 16

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DAM STATISTICS

HEIGHT OF DAM = 13 FT (FIELD MEASURED: TOP OF DAM TO OUTLET INVERT; "TOP OF DAM" HERE AND ON ALL SUBSEQUENT CALCULATION SHEETS REFERS TO THE LOW AREA IN THE EMBANKMENT CREST.)

NORMAL POOL STORAGE CAPACITY = 19 AC-FT (HEC-1)

MAXIMUM POOL STORAGE CAPACITY = 39 AC-FT (HEC-1)
(@ TOP OF DAM)

DRAINAGE AREA = 0.45 SQUARE MILES (PLANIMETERED ON USGS 7.5' TOPO QUAD - LAKE MASKENOZHA, PA)

ELEVATIONS:

TOP OF DAM (DESIGN)	= NOT KNOWN	
TOP OF DAM (FIELD)	= 1144.7	(SEE NOTE 1)
NORMAL POOL	= 1142.0	(SEE NOTE 1)
UPSTREAM INLET INVERT (DESIGN)	= NOT KNOWN	
DOWNSTREAM OUTLET INVERT (DESIGN)	= NOT KNOWN	
DOWNSTREAM OUTLET INVERT (FIELD)	= 1131.9	(SEE NOTE 1)
STREAMBED @ DAM CENTERLINE	= NOT KNOWN	

NOTE 1: NORMAL POOL ELEVATION IS ESTIMATED TO BE APPROXIMATELY AT ELEVATION 1142.0, FROM USGS TOPO QUAD, LAKE MASKENOZHA, PA. THE ELEVATIONS USED IN THIS ANALYSIS ARE CONSIDERED ESTIMATES, AND ARE NOT NECESSARILY ACCURATE.

SUBJECT DAM SAFETY INSPECTION
SOUTH POND DAM

BY RJS DATE 11-24-80 PROJ. NO. 80-238-639

CHKD. BY JKL DATE 12/19/80 SHEET NO. 2 OF 16

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DAM CLASSIFICATION

DAM SIZE: SMALL (REF 1, TABLE 1)

HAZARD CLASSIFICATION: HIGH (FIELD OBSERVATION)

REQUIRED SDF: ½PMF TO PMF (REF 1, TABLE 3)

HYDROGRAPH PARAMETERS

- LENGTH OF LONGEST WATERCOURSE: $L = 1.1$ MILES

- LENGTH OF LONGEST WATERCOURSE FROM DAM TO A POINT OPPOSITE BASIN CENTROID: $L_{CA} = 0.5$ MILES

(MEASURED ON USGS TOPO QUAD – LAKE MASKENOZHA, PA)

$C_t = 1.23$
$C_p = 0.45$

(SUPPLIED BY C.O.E., ZONE 1, DELAWARE RIVER BASIN)

SNYDER'S STANDARD LAG:

$$t_p = C_t (L \cdot L_{CA})^{0.3}$$
$$= 1.23 (1.1 \times 0.5)^{0.3}$$
$$= 1.03 \text{ HOURS}$$

(NOTE: HYDROGRAPH VARIABLES USED HERE ARE DEFINED IN REF. 2, IN SECTION ENTITLED "SNYDER SYNTHETIC UNIT HYDROGRAPH")

SUBJECT DAM SAFETY INSPECTION
SOUTH POND DAM

BY JJS DATE 11-24-80 PROJ. NO. 80-339-639

CHKD. BY JKL DATE 12/19/80 SHEET NO. 3 OF 16

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RESERVOIR STORAGE CAPACITY

RESERVOIR SURFACE AREAS:

SURFACE AREA (S.A.) @ NORMAL POOL (ELEV. 1142.0) = 6 ACRES

S.A. @ ELEV. 1140.0 = 3.5 ACRES
S.A. @ ELEV. 1160.0 = 26 ACRES

(PLANIMETERED ON LAKE MASSENOZHA USGS TOPO QUAD)

S.A. @ TOP OF DAM (ELEV. 1144.7) = 9.0 ACRES

(BY LINEAR INTERPOLATION)

THE "ZERO-STORAGE" ELEVATION IS ASSUMED TO BE AT 1132.0, OR APPROXIMATELY AT THE SAME ELEVATION AS THE DOWNSTREAM INVERT OF THE OUTLET CONDUIT.

ELEVATION - STORAGE RELATIONSHIP:

THE ELEVATION-STORAGE RELATIONSHIP IS COMPUTED INTERNALLY IN THE HEC-1 PROGRAM, BY USE OF THE CONIC METHOD, BASED ON THE GIVEN RESERVOIR SURFACE AREA AND ELEVATION DATA. (SEE SUMMARY INPUT / OUTPUT SHEETS.)

SUBJECT DAM SAFETY INSPECTION
SOUTH POND DAM

BY DJS DATE 11-24-80 PROJ. NO. 20-328-639

CHKD. BY JW DATE 12/1/80 SHEET NO. 1 OF 16

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PMP CALCULATIONS

- APPROXIMATE RAINFALL INDEX = 22.0 INCHES
  (CORRESPONDING TO A DURATION OF 24 HOURS AND A DRAINAGE AREA OF 200 SQUARE MILES.)

  (REF 3, FIG. 1)

- DEPTH - AREA - DURATION ZONE 1 (REF. 3, FIG. 1)

- ASSUME DATA CORRESPONDING TO A 10-SQUARE MILE AREA MAY BE APPLIED TO THIS 0.45-SQUARE MILE BASIN:

DURATION (HRS)	PERCENT OF INDEX RAINFALL
6	111
12	123
24	133
48	142

(REF 3, FIG. 3).

HOP BROOK FACTOR (ADJUSTMENT FOR BASIN SHAPE AND FOR THE LESSER LIKELIHOOD OF A SEVERE STORM CENTERING OVER A SMALL BASIN) FOR A DRAINAGE AREA OF 0.45 SQUARE MILES IS 1.30.

(REF 4, p. 48)

SUBJECT DAM SAFETY INSPECTION
SOUTH POND DAM

BY DJS DATE 11-25-80 PROJ. NO. 80-238-639

CHKD. BY JRL DATE 12-19-80 SHEET NO. 5 OF 16

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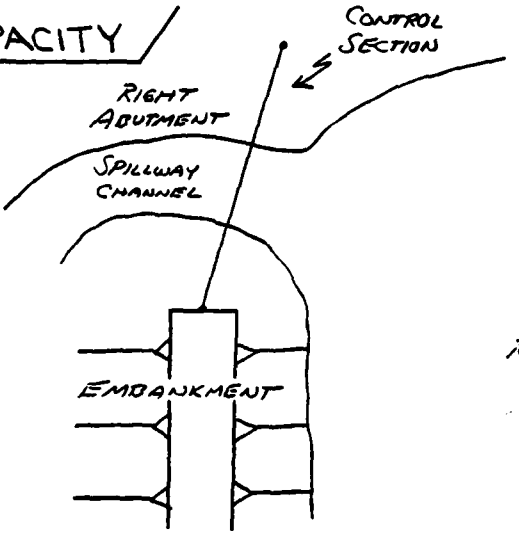
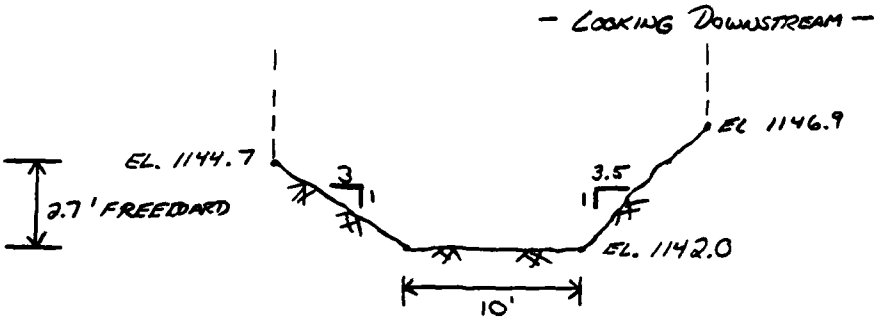
SPILLWAY CAPACITY

PLAN:



CONTROL SECTION:



(NOT TO SCALE)

- SKETCHES BASED ON FIELD NOTES AND OBSERVATIONS.

THE SPILLWAY CONSISTS OF A TRAPEZOIDAL CHANNEL CUT THROUGH SOIL AND ROCK ALONG THE RIGHT ABUTMENT. THE CONTROL SECTION IS LOCATED AT THE RESERVOIR OUTLET, AS SHOWN ABOVE. THE SECTION IS APPROXIMATELY TRAPEZOIDAL, WITH 3H:1V AND 3.5H:1V SIDE-SLOPES, AND A BOTTOM WIDTH OF ABOUT 10 FEET.

ASSUMING THAT CRITICAL FLOW OCCURS AT THE CONTROL SECTION,

$$\frac{Q^2 T}{g A^3} = 1.0$$ (REF 5, p. 8-7)

SUBJECT DAM SAFETY INSPECTION
SOUTH POND DAM

BY DJS DATE 11-25-80 PROJ. NO. 80-238-639
CHKD. BY JRL DATE 12/10/80 SHEET NO. 6 OF 16

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WHERE Q = DISCHARGE, IN CFS,
T = TOP WIDTH OF FLOW AREA, IN FT,
g = GRAVITATIONAL ACCELERATION CONSTANT = 32.2 FT/SEC^2,
A = FLOW AREA, IN FT^2.

ALSO,

$$H_m = D_c + \frac{D_m}{2}$$

AND

$$D_m = A/T \quad , \qquad \text{(REF 5, p. 8-8)}$$

WHERE

H_m = TOTAL HEAD AT CRITICAL DEPTH, OR MINIMUM SPECIFIC ENERGY, IN FT,
D_c = CRITICAL DEPTH, IN FT,
D_m = MEAN DEPTH OF FLOW AREA, IN FT.

THE RESERVOIR ELEVATION CORRESPONDING TO ANY PARTICULAR DISCHARGE IS THEN H_m + 1142.0 (WHERE INVERT OF CONTROL SECTION = 1142.0). THIS IS BASED ON THE ASSUMPTION OF ZERO-VELOCITY HEAD AT THE RESERVOIR JUST UPSTREAM OF THE CONTROL SECTION, AND NEGLIGIBLE HEAD LOSS TO THE CONTROL SECTION $\Rightarrow$ NO APPROACH LOSSES.

SUBJECT DAM SAFETY INSPECTION
SOUTH POND DAM

BY DJS DATE 11-25-80 PROJ. NO. 20-238-639

CHKD. BY JRL DATE 12-18-80 SHEET NO. 7 OF 16

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SPILLWAY RATING TABLE:

D_c (FT)	A ① (FT^2)	T ② (FT)	Dm ③ (FT)	Hm ④ (FT)	Q ⑤ (CFS)	RESERVOIR ELEVATION ⑥ (FT)	
0.5	5.8	13.3	0.4	0.7	20	1142.7	
1.0	13.3	16.5	0.8	1.4	70	1143.4	
1.5	22.3	19.8	1.1	2.1	130	1144.1	
2.0	33.0	23.0	1.4	2.7	220	1144.7	(TOP OF DAM)
2.5	45.3	26.3	1.7	3.4	340	1145.4	
3.0	59.1	28.6	2.1	4.0	480	1146.0	
3.5	73.9	30.4	2.4	4.7	650	1146.7	
4.0	89.5	32.1	2.8	5.4	850	1147.4	
4.5	106.0	33.8	3.1	6.1	1060	1148.1	
5.0	123.3	35.3	3.5	6.7	1310	1148.7	

① FOR $D_c \leq 2.7$, $A = 10D_c + 3.25D_c^2$

$2.7 \leq D_c \leq 4.9$, $A = 50.7 + (D_c - 2.7)^2(1.75) + 27.55(D_c - 2.7)$

$D_c \geq 4.9$, $A = 119.8 + 35.3(D_c - 4.9)$

② FOR $D_c \leq 2.7$, $T = 10 + 6.5\,D_c$

$2.7 \leq D_c \leq 4.9$, $T = 27.6 + 3.5(D_c - 2.7)$

$D_c \geq 4.9$, $T = 35.3$

③ $D_m = A/T$

④ $H_m = D_c + D_m/2$

⑤ $Q = \sqrt{gA^3/T}$, TO NEAREST 10 CFS.

⑥ RESERVOIR ELEVATION $= H_m + 1142.0$

SUBJECT DAM SAFETY INSPECTION
SOUTH POND DAM

BY DJS DATE 11-26-80 PROJ. NO. 80-238-639

CHKD. BY JRL DATE 12/18/80 SHEET NO. 8 OF 16

gai CONSULTANTS, INC.
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EMBANKMENT RATING TABLE

ASSUME THAT THE EMBANKMENT BEHAVES ESSENTIALLY AS A BROAD-CRESTED WEIR WHEN OVERTOPPING OCCURS. THUS, THE DISCHARGE CAN BE ESTIMATED BY THE RELATIONSHIP

$$Q = CLH^{3/2}$$ (REF 5, p. 5-23)

WHERE Q = DISCHARGE OVER EMBANKMENT, IN CFS,
L = LENGTH OF EMBANKMENT OVERTOPPED, IN FT,
H = HEAD, IN FT; IN THIS CASE IT IS THE AVERAGE "FLOW-AREA" WEIGHTED HEAD ABOVE THE CREST;
C = COEFFICIENT OF DISCHARGE, DEPENDENT UPON THE HEAD AND ON THE BREADTH OF THE CREST.

LENGTH OF EMBANKMENT INUNDATED VS RESERVOIR ELEVATION:

RESERVOIR ELEVATION (FT)	EMBANKMENT LENGTH (FT)
1144.7	0
1145.3	40
1145.4	95
1145.5	115
1145.6	175
1145.8	250
1146.0	255
1146.5	255
1147.0	260
1148.0	275
1149.0	290

(BASED ON FIELD SURVEY AND USGS TOPO QUAD - LAKE MARIE DONA, PA)

SUBJECT DAM SAFETY INSPECTION
SOUTH POND DAM

BY DJS DATE 11-26-80 PROJ. NO. 80-238-639

CHKD. BY [illegible] DATE 12/18/80 SHEET NO. 9 OF 16

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ASSUME THAT INCREMENTAL DISCHARGES OVER THE EMBANKMENT FOR SUCCESSIVE RESERVOIR ELEVATIONS ARE APPROXIMATELY TRAPEZOIDAL IN CROSS-SECTIONAL FLOW AREA. THEN ANY INCREMENTAL AREA OF FLOW CAN BE ESTIMATED AS $H_i [(L_1+L_2)/2]$, WHERE L_1 = LENGTH OF EMBANKMENT INUNDATED AT HIGHER ELEVATION, L_2 = LENGTH AT LOWER ELEVATION, AND H_i = DIFFERENCE IN ELEVATIONS. THUS, THE TOTAL AVERAGE "FLOW-AREA WEIGHTED" HEAD CAN BE ESTIMATED AS H_w = (TOTAL FLOW AREA / L_1).

EMBANKMENT RATING TABLE:

RESERVOIR ELEVATION (FT)	L_1 (FT)	L_2 (FT)	INCREMENTAL HEAD, H_i (FT)	① INCREMENTAL FLOW AREA, A_i (FT^2)	TOTAL FLOW AREA, A_T (FT^2)	② WEIGHTED HEAD, H_w (FT)	③ H_w/l	④ C	⑤ Q (CFS)
1144.7	0	—	—	—	—	—	—	—	0
1145.3	40	0	0.6	12	12	0.3	0.02	2.99	20
1145.4	95	40	0.1	7	19	0.2	0.02	2.97	30
1145.5	115	95	0.1	11	30	0.3	0.02	2.99	60
1145.6	175	115	0.1	15	45	0.3	0.02	2.99	90
1145.8	250	175	0.2	43	88	0.4	0.03	3.01	190
1146.0	255	250	0.2	51	139	0.5	0.04	3.02	270
1146.5	255	255	0.5	128	267	1.0	0.08	3.03	770
1147.0	260	255	0.5	129	396	1.5	0.12	3.04	1450
1148.0	275	260	1.0	268	664	2.4	0.18	3.07	3140
1149.0	290	275	1.0	283	947	3.3	0.25	3.08	5350

① $A_i = H_i \left[\frac{L_1+L_2}{2}\right]$
② $H_w = A_T / L_1$
③ l = BREADTH OF CREST = 13 FT.
④ $C = f(H, l)$, FROM REF 12, FIG 24.
⑤ $Q = C L_1 H_w^{3/2}$

SUBJECT DAM SAFETY INSPECTION
SOUTH POND DAM

BY DDS DATE 11-26-80 PROJ. NO. 80-229-639

CHKD. BY JHL DATE 12/18/80 SHEET NO. 10 OF 16

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TOTAL FACILITY RATING CURVE

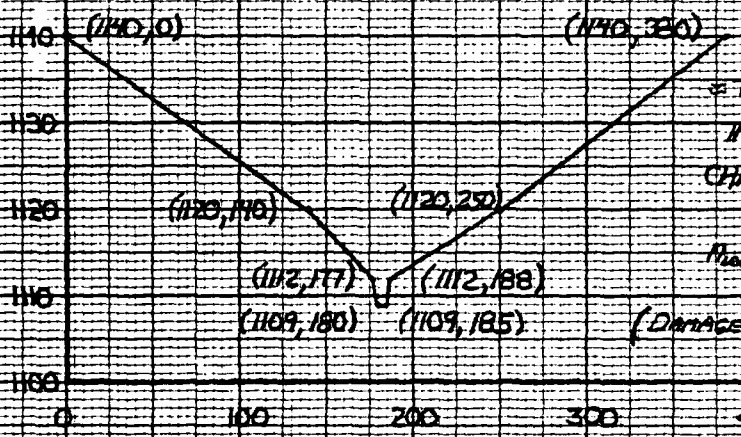
$$Q_{TOTAL} = Q_{SPILLWAY} + Q_{EMBANKMENT}$$

	RESERVOIR ELEVATION (FT)	① $Q_{SPILLWAY}$ (CFS)	② $Q_{EMBANKMENT}$ (CFS)	Q_{TOTAL} (CFS)
	1142.0	0	—	0
	1142.5	10	—	10
	1143.0	40	—	40
	1143.5	80	—	80
	1144.0	120	—	120
	1144.5	190	—	190
(TOP OF DAM)	1144.7	220	0	220
	1145.0	270	10	280
	1145.3	320	20	340
	1145.5	360	60	420
	1145.8	430	190	620
	1146.0	480	270	750
	1146.5	600	770	1370
	1147.0	740	1450	2190
	1148.0	1030	3140	4170

① FROM SHEET 7, BY LINEAR INTERPOLATION
② FROM SHEET 9

SUBJECT SOUTH POND DAM
BY JDS DATE 12-22-10 SHEET NO. 11 OF 16
CHKD BY RL DATE 12/16/10 PROJECT NO 30-338-439

DOWNSTREAM ROUTING SECTIONS



SECTION 1

= 190 F.T. D.S. FROM DAM

INVERT = 1109.0

CHANNEL SLOPE = 0.067

$n_{LB} = 0.040$

$n_{MC} = 0.050$, $n_{RB} = 0.080$

(DAMAGE LEVEL OF STRUCTURE = 1118)

(NOTE: SECTIONS BASED ON FIELD NOTES AND OBSERVATIONS ALSO USES TOPO QUAD - LAKE MASSAPONAX, PA. ELEVATIONS ARE CONSIDERED ESTIMATES AND ARE NOT NECESSARILY ACCURATE.)

SUBJECT DAM SAFETY INSPECTION
SOUTH POND DAM

BY 235 DATE 1-2-81 PROJ. NO. 80-238-639

CHKD. BY WJV DATE 1-6-81 SHEET NO. 12 OF 16

GAI CONSULTANTS, INC.
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DOWNSTREAM WILD ACRES LAKE DAM:

THE FOLLOWING DATA WAS OBTAINED FROM THE PHASE I INSPECTION REPORT, NATIONAL DAM INSPECTION PROGRAM, WILD ACRES LAKE DAM, PENN DER I.D. No. 52-65, PREPARED BY GAI CONSULTANTS, INC.; JANUARY, 1981.

NORMAL POOL ELEVATION = 1095.0 FT (SPILLWAY CREST)
LOW TOP OF DAM ELEVATION = 1096.3 FT

RESERVOIR SURFACE AREA VS. ELEVATION DATA:

ELEVATION (FT)	SURFACE AREA (ACRES)
1088.9	0.0
1095.0	82.0
1096.3	85.6
1100.0	96.0
1120.0	135.0

FACILITY RATING TABLE: COMPUTED INTERNALLY IN HEC-1 PROGRAM:

INPUT DATA: SPILLWAY CAPACITY: ESTIMATED AS $Q = CLH^{3/2}$, WHERE $C = 3.4$, $L = 42.2$

EMBANKMENT RATING TABLE: BASED ON CRITICAL DEPTH ON CREST OF DAM:

RESERVOIR ELEVATION (FT):	1096.3	1096.5	1096.6	1096.8	1096.9	1097.0	1097.2	1098.0	1099.0	1100.0
LENGTH OF CREST INUNDATED (FT):	0	50	65	275	335	420	495	510	535	560

SUBJECT DAM SAFETY INSPECTION
SOUTH POND DAM

BY ZJS DATE 1-2-81 PROJ. NO. 80-238-639

CHKD. BY WJV DATE 1-6-81 SHEET NO. 13 OF 16

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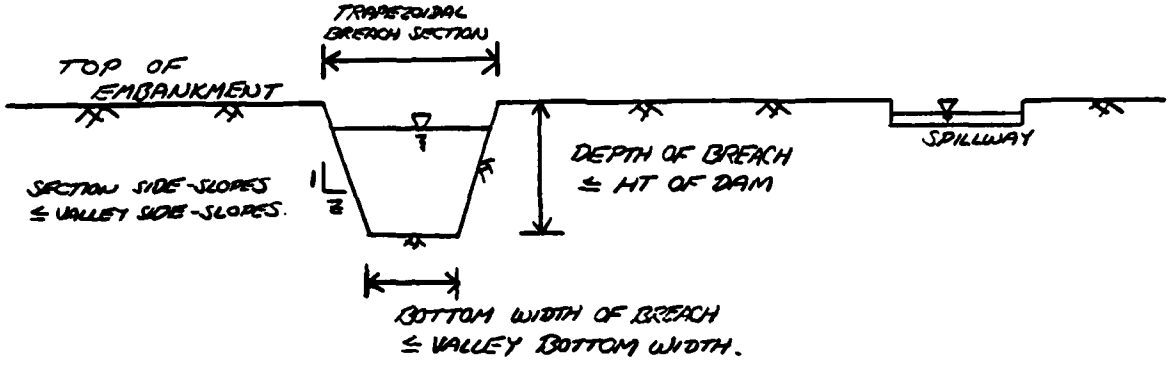
BREACH ASSUMPTIONS - SOUTH POND DAM

TYPICAL BREACH SECTION:



HEC-1 DAM BREACHING ANALYSIS INPUT:

(ASSUME BREACHING COMMENCES WHEN RESERVOIR LEVEL REACHES LOW TOP OF DAM ELEVATION: 1144.7)

PLAN	BREACH BOTTOM WIDTH (FT)	MAX. BREACH DEPTH (FT)	SECTION SIDE-SLOPES	BREACH TIME (HRS)	W.S.EL. AT START OF FAILURE (FT)
① MIN. BREACH SECTION MIN. FAIL TIME	10	12.7	1H:1V	0.5	1144.7
② MAX. BREACH SECTION MIN. FAIL TIME	150	12.7	4:1	0.5	1144.7
③ MIN. BREACH SECTION MAX. FAIL TIME	10	12.7	1:1	3.0	1144.7
④ MAX. BREACH SECTION MAX. FAIL TIME	150	12.7	4:1	3.0	1144.7
⑤ AVERAGE POSSIBLE CONDITIONS	40	12.7	1:1	1.0	1144.7

SUBJECT DAM SAFETY INSPECTION
South Pond Dam

BY DJS DATE 1-2-81 PROJ. NO. 80-238-639

CHKD. BY WJV DATE 1-6-81 SHEET NO. 14 OF 16

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THE BREACH ASSUMPTIONS LISTED ON SHEET 13 ARE BASED ON THE SUGGESTED RANGES PROVIDED BY THE C.O.E. (BALTIMORE DISTRICT), AND ON THE PHYSICAL CONSTRAINTS OF THE DAM AND SURROUNDING TERRAIN:

- DEPTH OF BREACH OPENING = 12.7 FT (LOW TOP OF DAM TO MINIMUM RESERVOIR ELEVATION)

- LENGTH OF BREACHABLE EMBANKMENT = 250 FT (FIELD MEASURED)

- VALLEY BOTTOM WIDTH = 150 FT (FIELD ESTIMATE)

- VALLEY SIDE-SLOPES ADJACENT TO DAM:

  LEFT SIDE: 10:1 (USGS TOPO QUAD - LAKE
  RIGHT SIDE: 10:1 MASKENOZHA, PA)

SUBJECT DAM SAFETY INSPECTION
SOUTH POND DAM
BY RJS DATE 12-5-81 PROJ. NO. 80-238-639
CHKD. BY WJV DATE 1-6-81 SHEET NO. 15 OF 16

HEC-1 DAM BREACHING ANALYSIS OUTPUT:

OUTFLOWS FROM SOUTH POND DAM:

BREACH PLAN	RATIO OF PMF	VARIABLE BREACH BOTTOM WIDTH (FT)	ACTUAL MAX. FLOW DURING FAIL TIME (CFS)	CORRESPONDING TIME OF PEAK FLOW (HRS)	INTERPOLATED OR HEC-1 ROUTED MAX FLOW DURING FAIL TIME (CFS)	CORRESPONDING TIME OF PEAK FLOW (HRS)	ACTUAL PEAK FLOW THROUGH DAM (CFS)	CORRESPONDING TIME OF PEAK FLOW (HRS)	TIME OF INITIAL BREACH (HRS)
①	0.25	10	1610	41.17	1610	41.17	1610	41.17	40.67
②	0.25	150	2212	40.87	2152	40.83	2212	40.87	40.67
③	0.25	10	491	42.56	488	42.50	491	42.56	40.67
④	0.25	150	656	41.17	656	41.17	656	41.17	40.67
⑤	0.25	40	1146	41.23	1122	41.17	1146	41.23	40.67
①	0.50	10	1620	39.67	1620	39.67	1620	39.67	39.17
②	0.50	150	2181	39.37	2107	39.33	2181	39.37	39.17
③	0.50	10	876	41.06	874	41.00	876	41.06	39.17
④	0.50	150	848	40.39	847	40.50	848	40.39	39.17
⑤	0.50	40	1187	39.75	1145	39.83	1187	39.75	39.17

NOTE: NON-BREACH 0.25 PMF PEAK DISCHARGE = 283 CFS
NON-BREACH 0.50 PMF PEAK DISCHARGE = 629 CFS

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SUBJECT DAM SAFETY INSPECTION
SOUTH POND DAM
BY DJS DATE 1-5-81 PROJ. NO. 80-238-639
CHKD. BY WJV DATE 1-6-91 SHEET NO. 16 OF 16

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DOWNSTREAM WILD ACRES LAKE: INFLOW/OUTFLOW DATA:

BREACH PLAN	RATIO OF PMF	SOUTH POND DAM BREACH BOTTOM WIDTH (FT)	MAXIMUM INFLOW: WILD ACRES LAKE (CFS)	MAXIMUM OUTFLOW: WILD ACRES LAKE (CFS)	MAXIMUM WATER SURFACE ELEVATION (FT)	MAXIMUM DEPTH OVER TOP OF DAM (EL. 1096.3) (FT)
①	0.25	10	1581	173	1096.1	—
②	0.25	150	1907	165	1096.1	—
③	0.25	10	488	188	1096.2	—
④	0.25	150	649	180	1096.2	—
⑤	0.25	40	1109	174	1096.1	—
NON-BREACH	0.25	—	283	121	1095.9	—
①	0.50	10	1587	381	1096.8	0.5
②	0.50	150	1862	371	1096.7	0.4
③	0.50	10	875	433	1096.8	0.5
④	0.50	150	848	393	1096.8	0.5
⑤	0.50	40	1155	382	1096.8	0.5
NON-BREACH	0.50	—	629	301	1096.6	0.3

SUBJECT DAM SAFETY INSPECTION
SOUTH POND DAM

BY WJV DATE 1-6-81 PROJ. NO. 80-239-639

CHKD. BY DJS DATE 1-7-81 SHEET NO. A OF K

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SUMMARY INPUT/OUTPUT SHEETS

OVERTOPPING ANALYSIS

```
DAM SAFETY INSPECTION
SOUTH POND DAM**** OVERTOPPING ANALYSIS ****
10-MINUTE TIME STEP AND 48-HOUR STORM DURATION

                                JOB SPECIFICATION
      NO   NHR  NMIN   IDAY   IHR   IMIN   METRC    IPLT   IPRT   NSTAN
     200     0    10      0     0      0       0       0      0       0
                       JOPER    NWT   LROPT   TRACE
                           5      0       0       0

                MULTI-PLAN ANALYSES TO BE PERFORMED
                    NPLAN= 1  NRTIO= 5  LRTIO= 1
          RTIOS=    .10    .20    .30    .50   1.00

**********    **********    **********    **********    **********

                      SUB-AREA RUNOFF COMPUTATION

                RESERVOIR INFLOW COMPUTATION
                     ISTAQ  ICOMP  IECON  ITAPE   JPLT   JPNT  INAME  ISTAGE  IAUTU
                         1      1      0       0      0      0      1       0      0

                          HYDROGRAPH DATA
      IHYDG  IUHG   TAREA   SNAP   TRSDA  TRSPC   RATIO  ISNOW  ISAME  LOCAL
          1     1    .45    0.00     .45   0.00   0.000      0      1      0

                          PRECIP DATA
            SPFE     PMS      R6     R12     R24     R48     R72     R96
            0.00   22.00  111.00  123.00  133.00  142.00    0.00    0.00
 TRSPC COMPUTED BY THE PROGRAM IS   .800

                          LOSS DATA                    INITIAL AND CONSTANT
                                                       RAINFALL LOSSES AS PER COE
      LROPT  STRKR  DLTKR  RTIOL  ERAIN  STRKS  RTIOK  STRTL  CNSTL  ALSMX  RTIMP
          0   0.00   0.00    1.00   0.00   0.00    1.00   1.00    .05   0.00   0.00

                       UNIT HYDROGRAPH DATA
            TP=  1.03   CP= .45   NTA=  0

 BASE FLOW PARAMETERS
 AS PER COE
                       RECESSION DATA
            STRTQ=   -1.50   QRCSN=    -.05   RTIOR= 2.00
 APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 6.70 AND R= 9.68 INTERVALS

      UNIT HYDROGRAPH 55 END-OF-PERIOD ORDINATES, LAG=  1.04 HOURS, CP= .45  VOL= 1.00
        7.   24.   53.   82.  108.  124.  120.  114.  107.   97.
       17.   74.   71.   64.   58.   52.   47.   42.   38.   34.
       31.   28.   25.   23.   21.   19.   17.   15.   14.   12.
       11.   10.    9.    8.    7.    7.    6.    5.    5.    4.
        4.    4.    3.    3.    3.    2.    2.    2.    2.    2.
        1.    1.    1.    1.    1.

                        END-OF-PERIOD FLOW
 U
 MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q   MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q
                                                                  SUM  24.99  22.60   2.39    38601.
                                                                       ( 635.)( 574.)( 61.)( 1093.06)
```

SUBJECT: DAM SAFETY INSPECTION
SOUTH POND DAM

BY: WJV DATE: 1-6-81 PROJ. NO.: 90-238-639
CHKD. BY: DJS DATE: 1-7-81 SHEET NO.: B OF K

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SOUTH POND DAM RESERVOIR INFLOW HYDROGRAPHS

0.2 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	258.	160.	53.	27.	7713.
CMS	7.	5.	1.	1.	218.
INCHES		3.30	4.35	4.43	4.43
MM		83.91	110.50	112.49	112.49
AC-FT		79.	104.	106.	106.
THOUS CU M		98.	129.	131.	131.

0.3 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	387.	240.	79.	40.	11569.
CMS	11.	7.	2.	1.	328.
INCHES		4.96	6.53	6.64	6.64
MM		125.86	165.75	168.74	168.74
AC-FT		119.	157.	159.	159.
THOUS CU M		147.	193.	197.	197.

0.5 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	644.	399.	132.	67.	19282.
CMS	18.	11.	4.	2.	546.
INCHES		8.26	10.88	11.07	11.07
MM		209.76	276.25	281.24	281.24
AC-FT		198.	261.	266.	266.
THOUS CU M		244.	322.	328.	328.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1289.	799.	263.	134.	38565.
CMS	36.	23.	7.	4.	1092.
INCHES		16.52	21.75	22.14	22.14
MM		419.53	552.50	562.47	562.47
AC-FT		396.	522.	531.	531.
THOUS CU M		489.	644.	655.	655.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE THROUGH RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
101	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1142.	-1

STAGE	1142.00	1142.50	1143.00	1143.50	1144.00	1144.50	1144.70	1145.00	1145.30
	1145.80	1146.00	1146.50	1147.00	1148.00				
FLOW	0.00	10.00	40.00	80.00	120.00	190.00	220.00	280.00	340.00
	620.00	750.00	1370.00	2190.00	4170.00				

SURFACE AREA=	0.	4.	6.	9.	26.
CAPACITY=	0.	9.	19.	39.	295.
ELEVATION=	1132.	1140.	1142.	1145.	1160.

CREL	SPWID	COQW	EXPW	ELEVL	COOL	CAREA	EXPL
1142.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1144.7	0.0	0.0	0.

SUBJECT DAM SAFETY INSPECTION

SOUTH POND DAM

BY WJV DATE 1-6-81 PROJ. NO. 80-239-631

CHKD. BY DJS DATE 1-7-81 SHEET NO. C OF K

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SOUTH POND DAM RESERVOIR OUTFLOW HYDROGRAPHS

PEAK OUTFLOW IS 220. AT TIME 41.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	220.	152.	50.	26.	7367.
CMS	6.	4.	1.	1.	209.
INCHES		3.15	4.17	4.23	4.23
MM		80.01	105.94	107.45	107.45
AC-FT		76.	100.	101.	101.
THOUS CU M		93.	123.	125.	125.

0.2 PMF

PEAK OUTFLOW IS 345. AT TIME 41.33 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	9.	231.	76.	39.	11146.
CMS	10.	7.	2.	1.	316.
INCHES		4.78	6.31	6.40	6.40
MM		121.37	160.31	162.56	162.56
AC-FT		115.	151.	154.	154.
THOUS CU M		141.	187.	189.	189.

0.3 PMF

PEAK OUTFLOW IS 629. AT TIME 40.83 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	629.	391.	128.	65.	18731.
CMS	18.	11.	4.	2.	530.
INCHES		8.09	10.61	10.76	10.76
MM		205.37	269.46	273.20	273.20
AC-FT		194.	254.	258.	258.
THOUS CU M		239.	314.	318.	318.

0.5 PMF

PEAK OUTFLOW IS 1275. AT TIME 40.83 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1275.	794.	258.	131.	37733.
CMS	36.	22.	7.	4.	1068.
INCHES		16.41	21.36	21.67	21.67
MM		416.81	542.50	550.34	550.34
AC-FT		394.	512.	520.	520.
THOUS CU M		486.	639.	641.	641.

PMF

SUMMARY OF DAM SAFETY ANALYSIS

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1142.00	1142.00	1144.70
STORAGE	19.	19.	39.
OUTFLOW	0.	0.	220.

OVERTOPPING OCCURS @ ≈ 0.2 PMF

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1143.77	0.00	31.	102.	0.00	41.83	0.00
.20	1144.70	0.00	39.	220.	0.00	41.50	0.00
.30	1145.31	.61	45.	345.	3.17	41.33	0.00
.50	1145.81	1.11	49.	629.	5.17	40.83	0.00
1.00	1146.42	1.72	56.	1275.	7.83	40.83	0.00

BREACHING ANALYSIS

DAM SAFETY INSPECTION
SOUTH POND DAM ** BREACH ANALYSIS ** (D.S. WILD ACRES LAKE DAM INCLUDED)
10-MINUTE TIME STEP AND 48-HOUR STORM DURATION

JOB SPECIFICATION

NU	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
288	0	10	0	0	0	0	0	0	0
			JOPER	NMT	LRUPT	THACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 6 NRTIO= 1 LRTIO= 1

RTIOS= .25

****

HYDROGRAPH ROUTING

PLAN

ROUTE THROUGH RESERVOIR

DAM DATA

TOPEL	COOD	EXPD	DAMWID
1144.7	0.0	0.0	0.

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
10.	1.00	1132.00	.50	1142.00	1144.70

STATION 101, PLAN 1, RATIO 1

(1) BEGIN DAM FAILURE AT 40.67 HOURS
PEAK OUTFLOW IS 1610. AT TIME 41.17 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1610.	255.	76.	38.	11014.
CMS	46.	7.	2.	1.	312.
INCHES		5.27	6.25	6.32	6.32
MM		133.95	158.76	160.64	160.64
AC-FT		126.	150.	152.	152.
THOUS CU M		156.	185.	187.	187.

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
150.	4.00	1132.00	.50	1142.00	1144.70

STATION 101, PLAN 2, RATIO 1

(2) BEGIN DAM FAILURE AT 40.67 HOURS
PEAK OUTFLOW IS 2212. AT TIME 40.87 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2152.	249.	74.	37.	10790.
CMS	61.	7.	2.	1.	306.
INCHES		5.15	6.12	6.20	6.20
MM		130.76	155.50	157.38	157.38
AC-FT		123.	147.	149.	149.
THOUS CU M		152.	181.	184.	184.

INPUT DATA IS SAME AS THAT FOR OVERTOPPING ANALYSIS WITH THE ADDITION OF THE BREACH DATA GIVEN HERE.

UNDER 0.25 PMF BASE FLOW CONDITIONS

SUBJECT DAM SAFETY INSPECTION
SOUTH POND DAM
BY WJV DATE 1-6-91
CHKD. BY JJS DATE 1-7-91
PROJ. NO. 90-238-634
SHEET NO. D OF K

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PLAN

SUBJECT DAM SAFETY INSPECTION

SOUTH POND DAM

BY WJV DATE 1-6-91 PROJ. NO. 90-238-631

CHKD. BY JJS DATE 1-7-81 SHEET NO. E OF K

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UNDER 0.25 PMF BASE FLOW CONDITIONS

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
10.	1.00	1132.00	3.00	1142.00	1144.70

STATION 101, PLAN 3, RATIO 1

③ BEGIN DAM FAILURE AT 40.67 HOURS

PEAK OUTFLOW IS 491. AT TIME 42.56 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	488.	255.	75.	38.	10996.
CMS	14.	7.	2.	1.	311.
INCHES		5.26	6.24	6.31	6.31
MM		133.69	158.50	160.38	160.38
AC-FT		126.	150.	151.	151.
THOUS CU M		156.	185.	187.	187.

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
150.	4.00	1132.00	3.00	1142.00	1144.70

STATION 101, PLAN 4, RATIO 1

④ BEGIN DAM FAILURE AT 40.67 HOURS

PEAK OUTFLOW IS 656. AT TIME 41.17 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	656.	254.	75.	38.	10983.
CMS	19.	7.	2.	1.	311.
INCHES		5.24	6.23	6.31	6.31
MM		133.53	158.31	160.19	160.19
AC-FT		126.	150.	151.	151.
THOUS CU M		156.	184.	187.	187.

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
40.	1.00	1132.00	1.00	1142.00	1144.70

STATION 101, PLAN 5, RATIO 1

⑤ BEGIN DAM FAILURE AT 40.67 HOURS

PEAK OUTFLOW IS 1146. AT TIME 41.23 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1122.	254.	75.	38.	10980.
CMS	32.	7.	2.	1.	311.
INCHES		5.26	6.23	6.30	6.30
MM		133.52	158.27	160.14	160.14
AC-FT		126.	149.	151.	151.
THOUS CU M		156.	184.	187.	187.

SUBJECT DAM SAFETY INSPECTION
SOUTH POND DAM
BY WJV DATE 1-6-81 PROJ. NO. 80-238-631
CHKD. BY RJS DATE 1-7-81 SHEET NO. F OF K

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HYDROGRAPH ROUTING

ROUTE FROM SOUTH POND DAM TO SECTION 11 780 FT D.S. FROM DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
SP-A	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPNP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELMN1	ELMAX	RLNTH	SEL
.0500	.0400	.0800	1109.0	1140.0	780.	.06700

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
0.00 1140.00 140.00 1120.00 177.00 1112.00 180.00 1109.00 185.00 1109.00
188.00 1112.00 250.00 1120.00 380.00 1140.00

STORAGE	0.00	.19	.49	1.20	2.50	4.39	6.87	9.95	13.65
	22.98	28.61	34.89	41.81	49.37	57.58	66.43	75.92	86.06
OUTFLOW	0.00	112.87	411.52	1088.41	2344.11	4375.16	7350.16	11392.39	16644.31
	31726.33	41854.55	53898.86	67996.75	84281.35	102881.86	123923.94	147530.08	173819.84
STAGE	1109.00	1110.63	1112.26	1113.89	1115.53	1117.16	1118.79	1120.42	1122.05
	1125.32	1126.95	1128.58	1130.21	1131.84	1133.47	1135.11	1136.74	1138.37
FLOW	0.00	112.87	411.52	1088.41	2344.11	4375.16	7350.16	11392.39	16644.31
	31726.33	41854.55	53898.86	67996.75	84281.35	102881.86	123923.94	147530.08	173819.84

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE THROUGH WILD ACRES LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
WAL	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPNP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1095.	0

SURFACE AREA=	0.	82.	86.	96.	135.					
CAPACITY=	0.	167.	276.	611.	2910.					
ELEVATION=	1089.	1095.	1096.	1100.	1120.					

CHEL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1095.0	42.2	3.4	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1096.3	0.0	0.0	0.

CREST LENGTH AT OR BELOW ELEVATION	0.	50.	65.	275.	335.	420.	495.	510.	535.	560.
	1096.3	1096.5	1096.6	1096.8	1096.9	1097.0	1097.2	1098.0	1099.0	1100.0

SUMMARY OF DAM SAFETY ANALYSIS

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1142.00	1142.00	1144.70
STORAGE	19.	19.	39.
OUTFLOW	0.	0.	220.

PLAN	RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1	.25	1144.84	.14	40.	1610.	.33	41.17	40.67
2	.25	1144.81	.11	40.	2212.	.22	40.87	40.67
3	.25	1144.91	.21	41.	491.	.78	42.56	40.67
4	.25	1144.87	.12	40.	656.	.33	41.17	40.67
5	.25	1144.83	.13	40.	1146.	.31	41.23	40.67
"NON-BREACH"	.25	1145.02	.32	42.	283.	4.33	41.33	0.00

SOUTH POND DAM

SECTION 1:

PLAN	RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1	.25	1581.	1114.8	41.17
2	.25	1907.	1115.0	40.83
3	.25	488.	1112.4	42.67
4	.25	649.	1112.8	41.17
5	.25	1109.	1113.9	41.17
"NON-BREACH"	.25	283.	1111.6	41.33

SECTION 1 @ 780 FT DS FROM SOUTH POND DAM

SUBJECT DAM SAFETY INSPECTION
SOUTH POND DAM
BY WJV DATE 1-6-81 PROJ. NO. 80-238-639
CHKD. BY [illegible] DATE 1-7-81 SHEET NO. 6 OF K

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SUBJECT DAM SAFETY INSPECTION

SOUTH POND DAM

BY WTV DATE 1-6-91 PROJ. NO. 90-238-639

CHKD. BY JJS DATE 1-7-91 SHEET NO. 4 OF K

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SUMMARY OF DAM SAFETY ANALYSIS

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1095.00	1095.00	1096.50
STORAGE	167.	167.	276.
OUTFLOW	0.	0.	213.

PLAN	RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1	.25	1096.13	0.00	262.	173.	0.00	43.00	0.00
2	.25	1096.10	0.00	259.	165.	0.00	43.00	0.00
3	.25	1096.20	0.00	267.	188.	0.00	43.50	0.00
4	.25	1096.16	0.00	264.	180.	0.00	43.17	0.00
5	.25	1096.14	0.00	262.	174.	0.00	43.00	0.00
"NEW BREACH"	.25	1095.89	0.00	241.	121.	0.00	44.33	0.00

WILD ACRES LAKE DAM

DAM SAFETY INSPECTION
SOUTH POND DAM ** BREACH ANALYSIS ** (U.S. WILD ACRES LAKE DAM INCLUDED)
10-MINUTE TIME STEP AND 48-HOUR STORM DURATION

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
288	0	10	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 6 NRTIO= 1 LRTIO= 1

RTIOS= .50

HYDROGRAPH ROUTING

ROUTE THROUGH RESERVOIR

DAM DATA

TOPEL	COOD	EXPD	DAMWID
1144.7	0.0	0.0	0.

DAM BREACH DATA

BRWID	Z	ELBR	TFAIL	WSEL	FAILEL
10.	1.00	1132.00	.50	1142.00	1144.70

STATION 101, PLAN 1, RATIO 1

PLAN ①

BEGIN DAM FAILURE AT 39.17 HOURS

PEAK OUTFLOW IS 1620. AT TIME 39.67 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1620.	867.	142.	72.	20661.
CMS	46.	13.	4.	2.	585.
INCHES		9.65	11.72	11.86	11.86
MM		245.04	297.61	301.35	301.35
AC-FT		231.	281.	285.	285.
THOUS CU M		285.	347.	351.	351.

UNDER 0.50 PMF BASE FLOW CONDITIONS

SUBJECT DAM SAFETY INSPECTION

SOUTH POND DAM

BY WJV DATE 1-6-91 PROJ. NO. 90-238-639

CHKD. BY JDS DATE 1-2-91 SHEET NO. 1 OF 15

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PLAN

UNDER 0.50 PMF BASE FLOW CONDITIONS

DAM BREACH DATA

BRNID	Z	ELBM	TFAIL	WSEL	FAILEL
150.	4.00	1132.00	.50	1142.00	1144.70

STATION 101, PLAN 2, RATIO 1

(2)

BEGIN DAM FAILURE AT 39.17 HOURS

PEAK OUTFLOW IS 2181. AT TIME 39.37 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2107.	461.	140.	71.	20450.
CMS	60.	13.	4.	2.	579.
INCHES		9.54	11.60	11.74	11.74
MM		242.28	294.53	298.27	298.27
AC-FT		229.	278.	282.	282.
THOUS CU M		282.	343.	347.	347.

DAM BREACH DATA

BRNID	Z	ELBM	TFAIL	WSEL	FAILEL
10.	1.00	1142.00	3.00	1142.00	1144.70

STATION 101, PLAN 3, RATIO 1

(3)

BEGIN DAM FAILURE AT 39.17 HOURS

PEAK OUTFLOW IS 876. AT TIME 41.06 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	874.	466.	142.	72.	20639.
CMS	25.	13.	4.	2.	584.
INCHES		9.63	11.70	11.85	11.85
MM		244.72	297.29	301.02	301.02
AC-FT		231.	281.	284.	284.
THOUS CU M		285.	346.	351.	351.

DAM BREACH DATA

BRNID	Z	ELBM	TFAIL	WSEL	FAILEL
150.	4.00	1132.00	3.00	1142.00	1144.70

STATION 101, PLAN 4, RATIO 1

(4)

BEGIN DAM FAILURE AT 39.17 HOURS

PEAK OUTFLOW IS 848. AT TIME 40.39 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	847.	466.	141.	72.	20626.
CMS	24.	13.	4.	2.	584.
INCHES		9.64	11.70	11.84	11.84
MM		244.80	297.10	300.84	300.84
AC-FT		231.	281.	284.	284.
THOUS CU M		285.	346.	350.	350.

SUBJECT DAM SAFETY INSPECTION

SOUTH POND DAM

BY WJV DATE 1-6-91 PROJ. NO. 80-239-639

CHKD. BY DJS DATE 1-7-91 SHEET NO. 3 OF 15

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PLAN

(5)

DAM BREACH DATA

BRWID	Z	ELBR	TFAIL	WSEL	FAILEL
40.	1.00	1132.00	1.00	1142.00	1144.70

STATION 101, PLAN 5, RATIO 1

BEGIN DAM FAILURE AT 39.17 HOURS

PEAK OUTFLOW IS 1187. AT TIME 39.75 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1145.	467.	142.	72.	20647.
CMS	32.	13.	4.	2.	585.
INCHES		9.65	11.71	11.86	11.86
MM		245.09	297.40	301.13	301.13
AC-FT		231.	281.	284.	284.
THOUS CU M		286.	346.	351.	351.

UNDER 0.50 PMF BASE FLOW CONDITIONS

SUMMARY OF DAM SAFETY ANALYSIS

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1142.00	1142.00	1144.70
STORAGE	19.	19.	39.
OUTFLOW	0.	0.	220.

PLAN	RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1	.50	1144.75	.05	39.	1620.	.29	39.67	39.17
2	.50	1144.73	.03	39.	2181.	.20	39.37	39.17
3	.50	1144.84	.14	40.	876.	1.17	41.06	39.17
4	.50	1144.74	.04	39.	840.	.28	40.39	39.17
5	.50	1144.74	.04	39.	1187.	.27	39.75	39.17
"non-breach"	.50	1145.81	1.11	49.	629.	5.17	40.83	0.00

SOUTH POND DAM

SECTION 1:

PLAN	RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1	.50	1587.	1114.5	39.67
2	.50	1862.	1114.9	39.33
3	.50	875.	1113.4	41.17
4	.50	840.	1113.3	40.50
5	.50	1155.	1114.0	39.83
"non-breach"	.50	629.	1112.8	40.83

SECTION 1 @ 780 Ft DS FROM SOUTH POND DAM

SUBJECT DAM SAFETY INSPECTION
SOUTH POND DAM

BY WJV DATE 1-6-81 PROJ. NO. 80-239-639

CHKD. BY JJS DATE 1-7-81 SHEET NO. K OF K

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WILD ACRES LAKE DAM

SUMMARY OF DAM SAFETY ANALYSIS

PLAN	RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
		INITIAL VALUE			SPILLWAY CREST		TOP OF DAM	
		ELEVATION 1095.00			1095.00		1096.30	
		STORAGE 167.			167.		276.	
		OUTFLOW 0.			0.		213.	
1	.50	1096.75	.45	315.	381.	5.83	42.83	0.00
2	.50	1096.74	.44	313.	371.	5.83	42.83	0.00
3	.50	1096.83	.53	321.	433.	5.50	42.50	0.00
4	.50	1096.77	.47	316.	393.	5.67	42.67	0.00
5	.50	1096.75	.45	315.	382.	5.83	42.83	0.00
"POND-BREACH"	.50	1096.59	.29	301.	301.	5.00	43.67	0.00

LIST OF REFERENCES

1. "Recommended Guidelines for Safety Inspection of Dams," prepared by Department of the Army, Office of the Chief of Engineers, Washington, D. C. (Appendix D).

2. "Unit Hydrograph Concepts and Calculations," by the U. S. Army, Corps of Engineers, Baltimore District (L-519).

3. "Seasonal Variation of Probable Maximum Precipitation East of the 105th Meridian for Areas from 10 to 1,000 Square Miles and Durations of 6, 12, 24, and 48 Hours," Hydrometeorological Report No. 33, prepared by J. T. Reidel, J. F. Appleby and R. W. Schloemer, Hydrologic Service Division, Hydrometeorological Section, U. S. Army, Corps of Engineers, Washington, D. C., April 1956.

4. Design of Small Dams, U. S. Department of the Interior, Bureau of Reclamation, Washington, D. C., 1973.

5. Handbook of Hydraulics, H. W. King, and E. F. Brater, McGraw-Hill, Inc., New York, 1963.

6. Standard Handbook for Civil Engineers, F. S. Merritt, McGraw-Hill, Inc., New York, 1963.

7. Open-Channel Hydraulics, V. T. Chow, McGraw-Hill, Inc., New York, 1959.

8. Weir Experiments, Coefficients, and Formulas, R. E. Horton, Water Supply and Irrigation Paper No. 200, Department of the Interior, United States Geological Survey, Washington, D. C., 1907.

9. "Probable Maximum Precipitation, Susquehanna River Drainage Above Harrisburg, Pennsylvania," Hydrometerological Report No. 40, prepared by H. V. Goodyear and J. T. Riedel, Hydrometeorological Branch Office of Hydrology, U. S. Weather Bureau, U. S. Department of Commerce, Washington, D. C., May, 1965.

10. Flood Hydrograph Package (HEC- 1) Dam Safety Version, Hydrologic Engineering Center, U. S. Army, Corps of Engineers, Davis, California, July 1978.

11. "Simultation of Flow Through Broad Crest Navigation Dams with Radial Gates," R. W. Schmitt, U. S. Army, Corps of Engineers, Pittsburgh District.

12. "Hydraulics of Bridge Waterways," BPR, 1970, Discharge Coefficient Based on Criteria for Embankment Shaped Weirs, Figure 24, page 46.

13. Applied Hydraulics in Engineering, H. M. Morris and J. N. Wiggert, Virginia Polytechnic Institute and State University, 2nd Edition, The Ronald Press Company, New York, 1972.

14. Standard Mathematical Tables, 21st Edition, The Chemical Rubber Company, 1973, page 15.

15. Engineering Field Manual, U. S. Department of Agriculture, Soil Conservation Service, 2nd Edition, Washington, D. C., 1969.

16. Water Resources Engineering, R. K. Linsley and J. B. Franzini, McGraw-Hill, Inc., New York, 1972.

17. Engineering for Dams, Volume 2, W. P. Creager, J. D. Justin, J. Hinds, John Wiley & Sons, Inc., New York, 1964.

APPENDIX E

FIGURES

LIST OF FIGURES

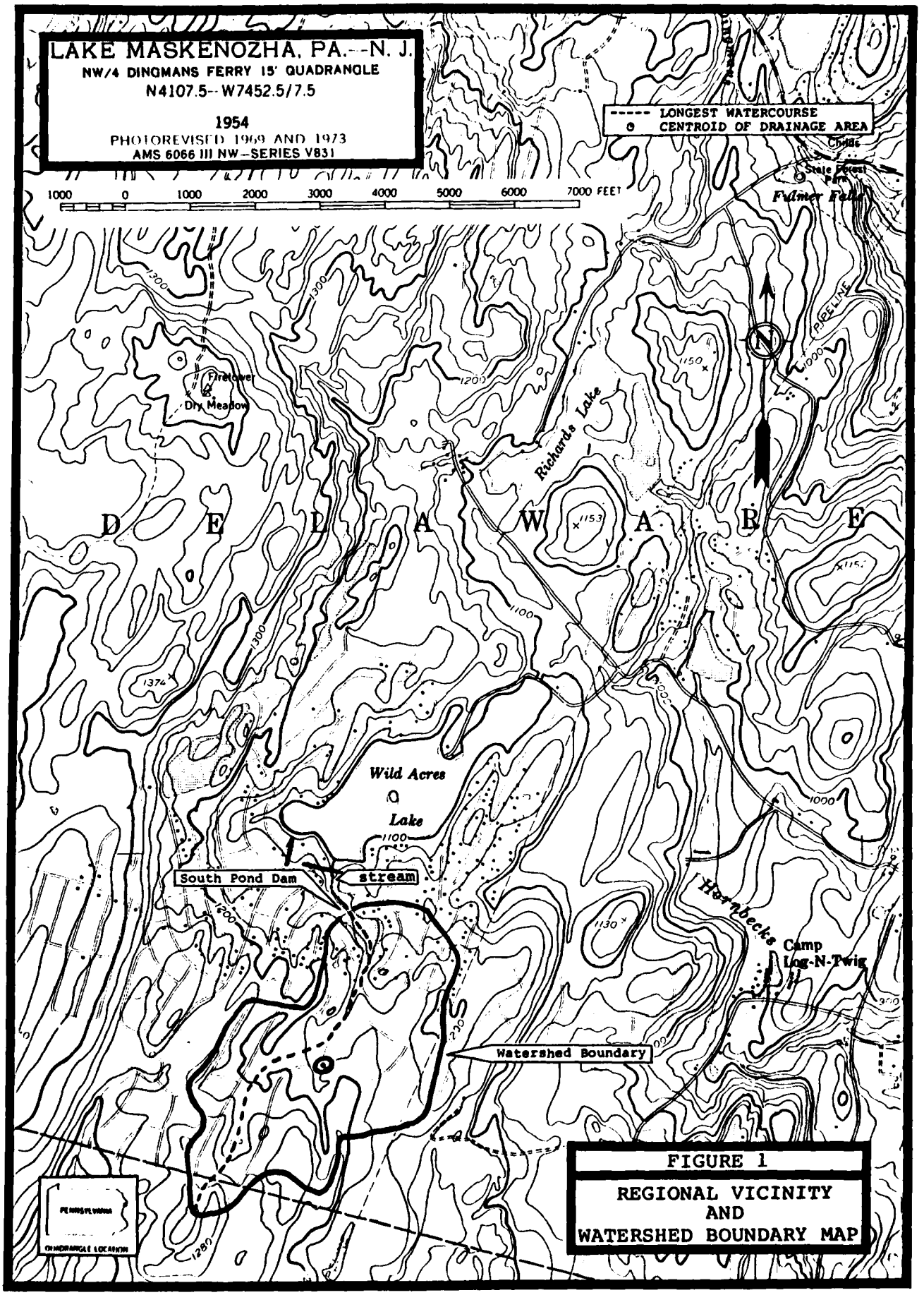


FIGURE 1

REGIONAL VICINITY AND WATERSHED BOUNDARY MAP

APPENDIX F

GEOLOGY

Geology

South Pond Dam is located in the glaciated Low Plateaus section of the Appalachian Plateaus physiographic province of eastern Pennsylvania. In this area, the Appalachian Plateaus province is characterized topographically by flat-topped, hummocky hills formed as a result of glaciation and subsequent stream dissection of nearly flat-lying strata. The Devonian age sedimentary rock strata in Pike County regionally strike N35°E and dip gently to the northwest. The Delaware River is the major drainage basin in the area. Major tributary streams intersect the Delaware River at right angles; whereas, smaller streams display a slightly more random tributary pattern. Both major and minor tributary stream systems are joint controlled and exhibit modified rectangular and trellis-type drainage patterns.

Structurally, the area containing Pike County lies on the south flank of a broad, asymmetrical synclinorium that plunges to the southwest. Superimposed on this broad structural basin are numerous anticlinal and synclinal folds characterized by planar limbs and narrow hinges. Due to prior glaciation, low relief and surficial soil cover, fold axes are difficult to trace.

The sedimentary rock sequences in the vicinity of the dam and reservoir are probably members of the Susquehanna Group of Upper Devonian age (see Geology Map). The sedimentological changes observed in the Catskill Formation indicate that the rate of sedimentation exceeded the rate of basin subsidence resulting in a facies change from marine to non-marine strata. On the accompanying geology map the delineation between the Middle and Upper Devonian age sedimentary rock sequences represents the Allegheny Front which separates the Valley and Ridge physiographic province from the Appalachian Plateaus physiographic province.

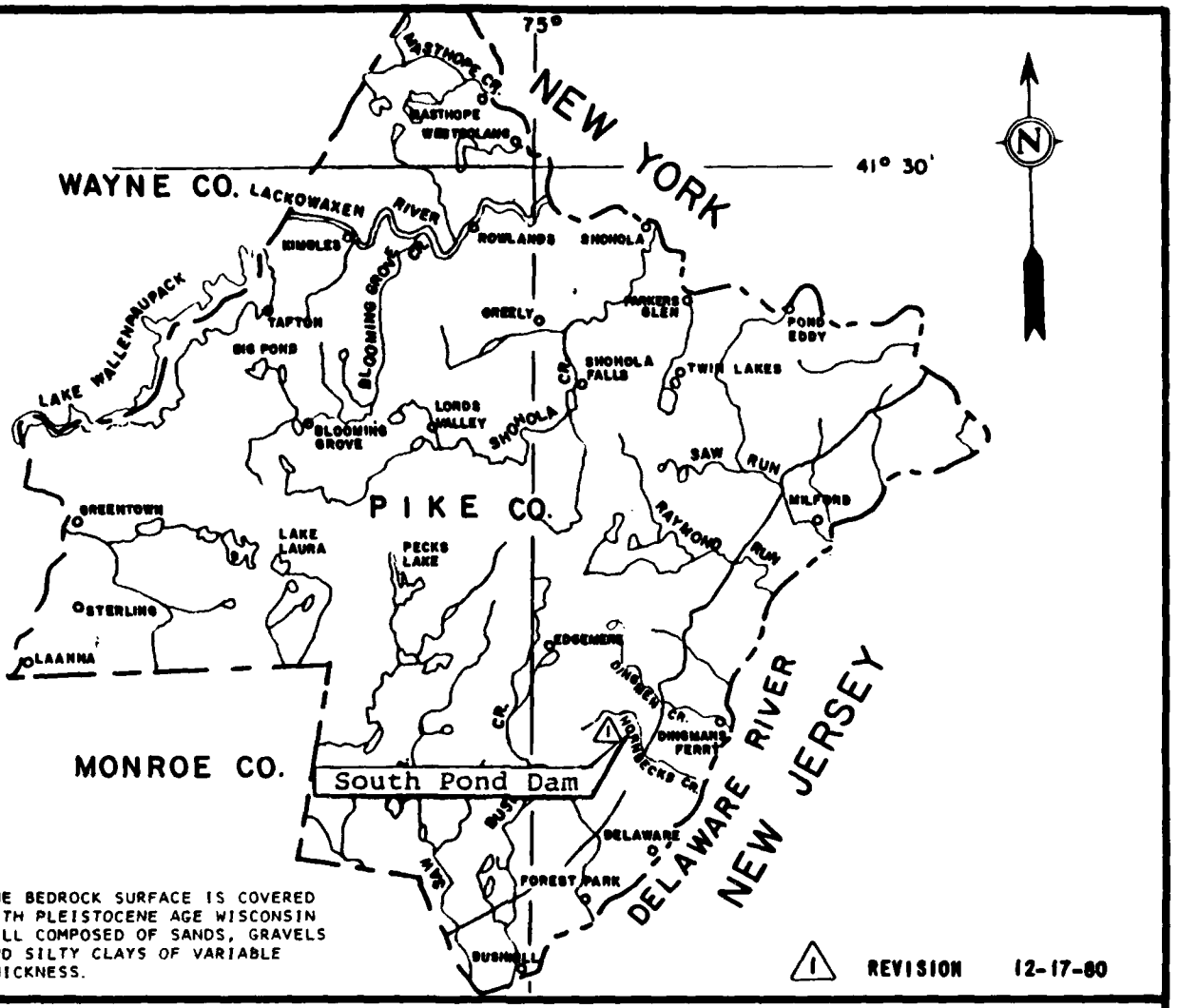
Approximately half of Pike County, including the dam site, is covered by a blanket of Wisconsin age (most recent) glacial drift which, based on the degree of weathering, was probably deposited during the Woodfordian stage. Valley bottoms are typically covered by recent alluvium and Woodfordian outwash of variable thickness, but typically less than 10 feet. These deposits are characteristically unconsolidated stratified sand and gravel usually with more gravel than sand and some small boulders. The direction of the Wisconsin ice advance, was from the northeast over the Catskill Mountains and from the north over the Appalachian Plateau. The terminal moraine resulting from the southern most advance of the Wisconsin ice sheet in this area is located in the southern portion of Monroe County which borders Pike County to the South.

References:

1. Fletcher, F. W., Woodrow, D. L., "Geology and Economic Resources of the Pennsylvania Portion of the Milford and Port Jervis 15 minute U.S.G.S. Topographic Quadrangles," Pennsylvania Geological Survey, Fourth Series, Harrisburg, Atlas 223, 1970.

2. Sevon, W. D., Berg, T. M., "Geology and Mineral Resources of the Skytop Quadrangle, Monroe and Pike Counties, Pennsylvania", Pennsylvania Geological Survey, Fourth Series, Harrisburg, Atlas 214A., 1978.

3. Sevon, W., Personal Communication, Commonwealth of Pennsylvania Department of Environmental Resources, Harrisburg, December 3, 1980.



NOTE: THE BEDROCK SURFACE IS COVERED WITH PLEISTOCENE AGE WISCONSIN TILL COMPOSED OF SANDS, GRAVELS AND SILTY CLAYS OF VARIABLE THICKNESS.

LEGEND

UPPER DEVONIAN

SUSQUEHANNA GROUP

Catskill Formation - *Shohola Member interbedded 5- to 25-foot thick units of greenish-gray and grayish-red very fine to medium-grained sandstone and sandy shale and lesser medium-gray to medium-dark-gray sandstone and shale. Sandstones are predominantly low-rank graywackes. Beds are thin to very thick and most have simple or planar sets of small- to medium-scale, generally low-angle cross stratification. Contacts with shale units are abruptly disconformable to gradational. Sandstones are poorly cleaved. Shale is thinly laminated and well cleaved. Mud cracks, convolute bedding, and rain marks are present near contacts with sandstone units. Member is more than 2,000 feet thick. Lower contact is gradational and is placed at top of highest red bed of the underlying Analomink. Analomink Red Shale Member, medium-grayish red silty, micaceous, finely laminated well-cleaved shale containing thin beds of brownish-gray sandy siltstone and silty very fine grained sandstone. Unit in the "first red" going up section in Upper Devonian sequence, member is about 100 feet thick. Lower contact is gradational and is placed at the base of lowest red bed. Delaware River Flags Member, grayish-green, micaceous, laminated sandstone and lesser interbedded sandy shale. Beds range from a few inches to as much as 4 feet thick. Sandstones are low-rank graywackes and contain no marine fossils. Member is about 300 feet thick. Lower contact is gradational.*

MIDDLE DEVONIAN

HAMILTON GROUP

Mahantango Formation - *Upper member medium-dark-gray, fairly coarse grained, thin-bedded siltstone and silty shale; member in about 700 feet thick and is separated from lower member by the "Centerfield Reef," a calcareous siltstone biostrome containing abundant horn corals. The Centerfield is about 75 feet thick, lower member, virtually same lithology as upper member. Unit is about 1,100 feet thick. Lower contact is gradational.*

Marcellus Shale - *Dark-gray, evenly laminated, silty clay shale and clayey silt shale. Unit commonly contains very hard limy concretions and is well cleaved; bedding is generally obscured. Member is about 75-feet thick. Lower contact is gradational.*

SCALE

0 6 12 18 MILES

REFERENCE:
GEOLOGIC MAP OF NORTHEASTERN PENNSYLVANIA. COMPILED BY GEO. W. STOSE AND O.A. LJUNGSTEDT COMMONWEALTH OF PENNSYLVANIA DEPT. OF INTERNAL AFFAIRS DATED 1932, SCALE 1" = 6 MILES.

GEOLOGY MAP

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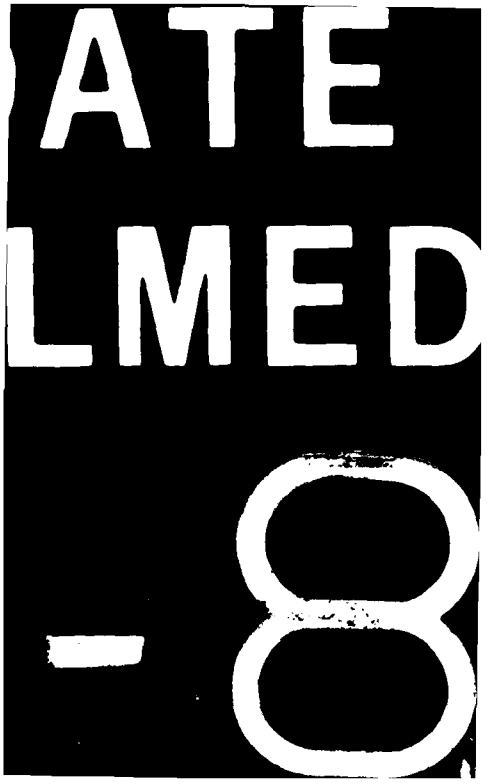
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